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U. S. ARMY AIR FORCES

SELECTION AND CLASSIFICATION FOR
AIR CREW DUTY

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STANINES

SELECTION

AND

CLASSIFICATION

FOR

AIR CREW

DUTY

REPORTED BY

THE AVIATION PSYCHOLOGY PROGRAM

OFFICE OF THE AIR SURGEON

HEADQUARTERS, ^{U.S.} ARMY AIR FORCES

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During the five year period from 1941 to 1946, a large group of professionally trained psychologists participated in a program of coordinated research known as the Aviation Psychology Program of the Army Air Forces. By the end of the war, the staff had grown to include over a thousand persons approximately half of whom had received some professional training in psychology beyond the baccalaureate degree. Some of the problems assigned to this group and some of the more important results achieved are presented and illustrated in the pages that follow.

S E L E C T I O N

AAF QUALIFYING EXAMINATION

From 1923 to 1939, the Army Air Forces produced 3505 rated pilots, no rated navigators and no rated bombardiers. It had long been generally recognized that aircrew duties place unique demands upon the human body and mind and consequently only the most fit could be expected to succeed. From 1927 to 1941 applicants were screened by requiring at least two years of college training, a rigid physical examination, and a comprehensive interview by an experienced Flight Surgeon or Aviation Medical Examiner.

When the demand for aircrew rose sharply because of the threatening international situation it became impossible to continue to fill the new quotas. To meet the needs of the expanding Air Forces, the Aviation Psychology Program developed tests of aptitude, interest, and proficiency which could be used to screen men regardless of their previous training.

With the elimination of the college requirement, the possibility of entering aircrew training in the Army Air Forces was open to thousands of young men, who now applied in great numbers to the Aviation Cadet Boards. An initial screening device was required that could be administered to a large group at one time, without involving extensive preparations. For this purpose the AAF Qualifying Examination, a paper and pencil test, was devised. This test, along with all the others in the program, was frequently modified

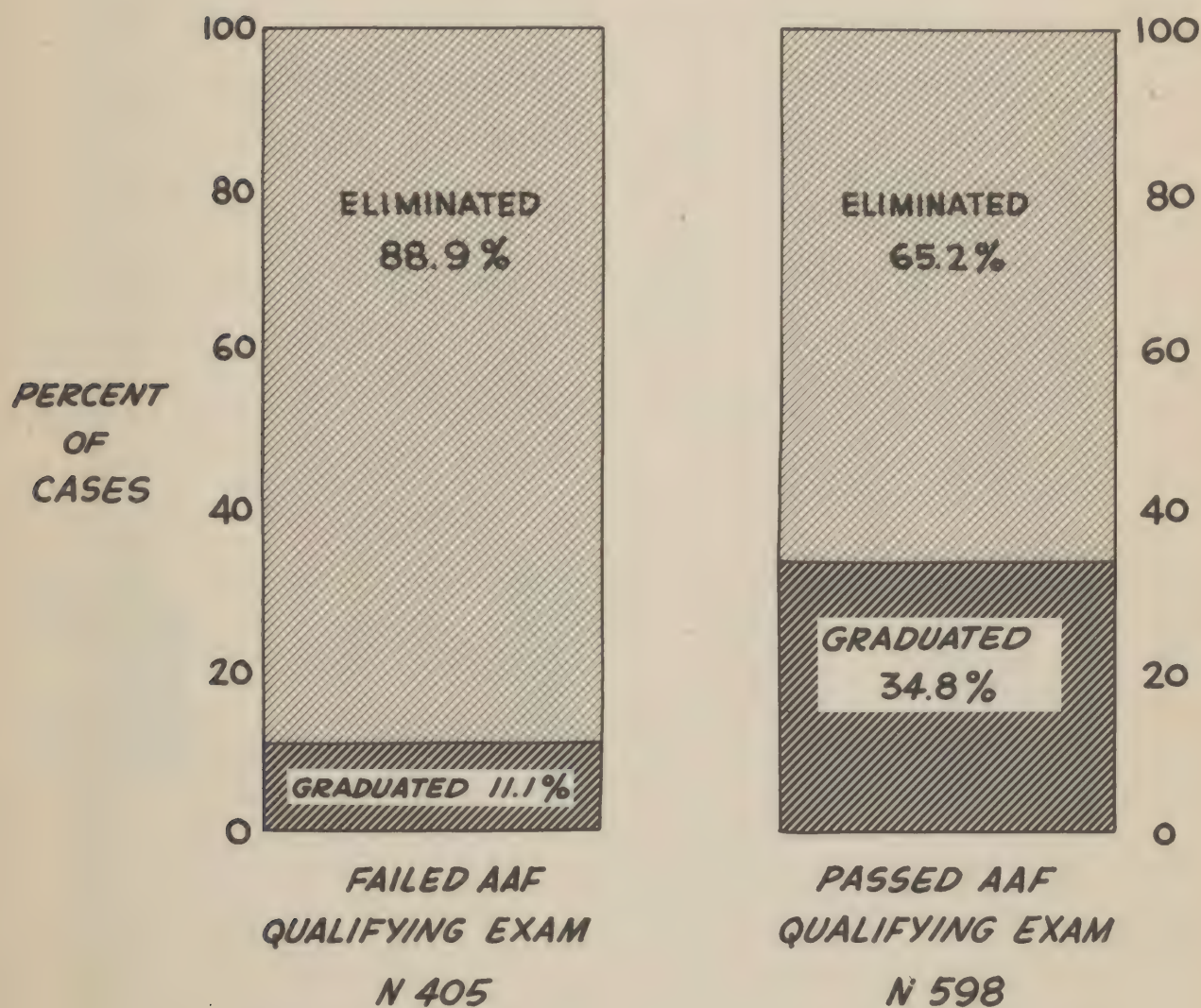
and improved as data on its predictive efficiency were accumulated. The passing score was also modified from time to time to meet the needs of the moment.

Well over a million young men took the examination. About 650,000 succeeded in passing.

The effectiveness of the Qualifying Examination was demonstrated in an experimental group of approximately 1000 applicants who were permitted to enter training regardless of what scores they obtained on the selection tests.

MEN WHO RECEIVE FAILING SCORES ON THE
AAF QUALIFYING EXAMINATION ARE POOR PROSPECTS
FOR PILOT TRAINING

EXPERIMENTAL GROUP
SUCCESS IN COMPLETE FLYING TRAINING



C L A S S I F I C A T I O N

AIRCREW CLASSIFICATION BATTERY

The different aircrew positions require different skills as well as training. A man who is careful, accurate, and mathematically inclined might make an excellent navigator but fail to make the grade as a pilot. The time and equipment involved in training would be wasted and a potentially excellent navigator turned away. Similarly the athletic, well-coordinated and energetic candidate who never got along well with his math instructor might fail miserably in navigator or bombardier training but would make an ace pilot if properly assigned.



It was clear that an instrument was needed that could measure the aptitude of the candidates who had passed the initial screening in order to assign them to best advantage. The Aircrew Classification Battery was designed to meet this need. The battery included paper and pencil tests that could be administered to several hundred men at one time and apparatus tests that required individual attention for each candidate, standardized conditions, and very carefully trained testers. Some of the functions measured by these tests were numerical ability, mechanical comprehension, general information about flying, the ability to read dials and tables, mathematical reasoning, reading comprehension, muscular coordination and perceptual speed.

For the purpose of predicting each man's chances of success for each kind of aircrew training, separate aptitude scores, called stanines, ranging from 9 (high) to 1 (low), for bombardier, navigator, and pilot were computed for each candidate from his performance on the Aircrew Classification Battery. The following three charts show the degree to which each of the stanines was able to predict success in their respective types of training.



PAPER AND PENCIL TEST

APPARATUS TEST

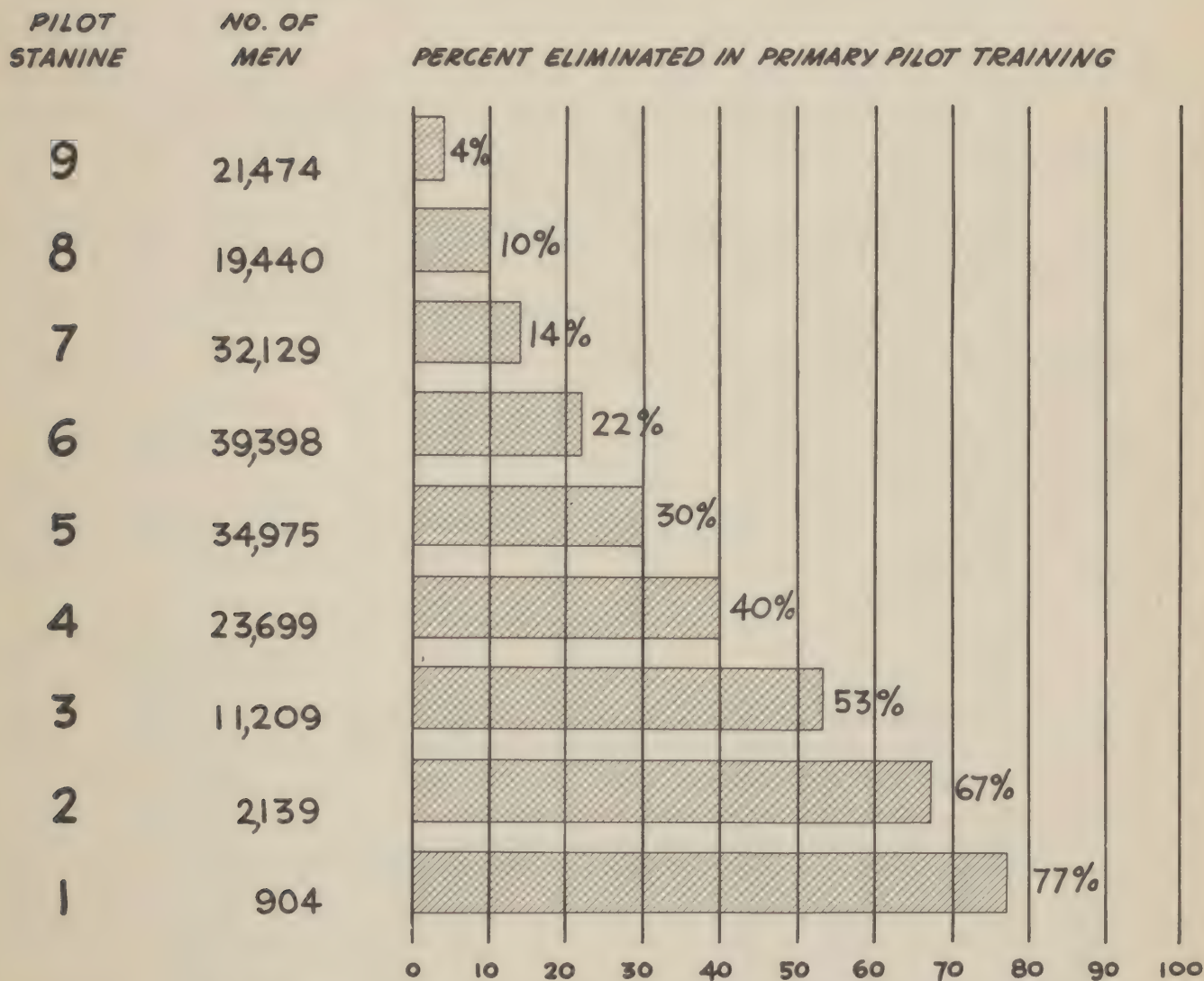


SELECTION FOR PILOT TRAINING

In this chart can be seen how useful an effective selection battery can be. If a candidate had a pilot stanine of 9, he was a good investment for pilot training. The chances were only 4 in 100 that he would fail in primary pilot training. The candidate with a pilot stanine of 1 had the odds against him with 77 chances in 100 to fail early in pilot training. He was not a good investment. The higher the stanine, the more assured was the investment.

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THE HIGHER THE PILOT STANINE THE GREATER THE CHANCES OF SUCCESS IN PRIMARY PILOT TRAINING



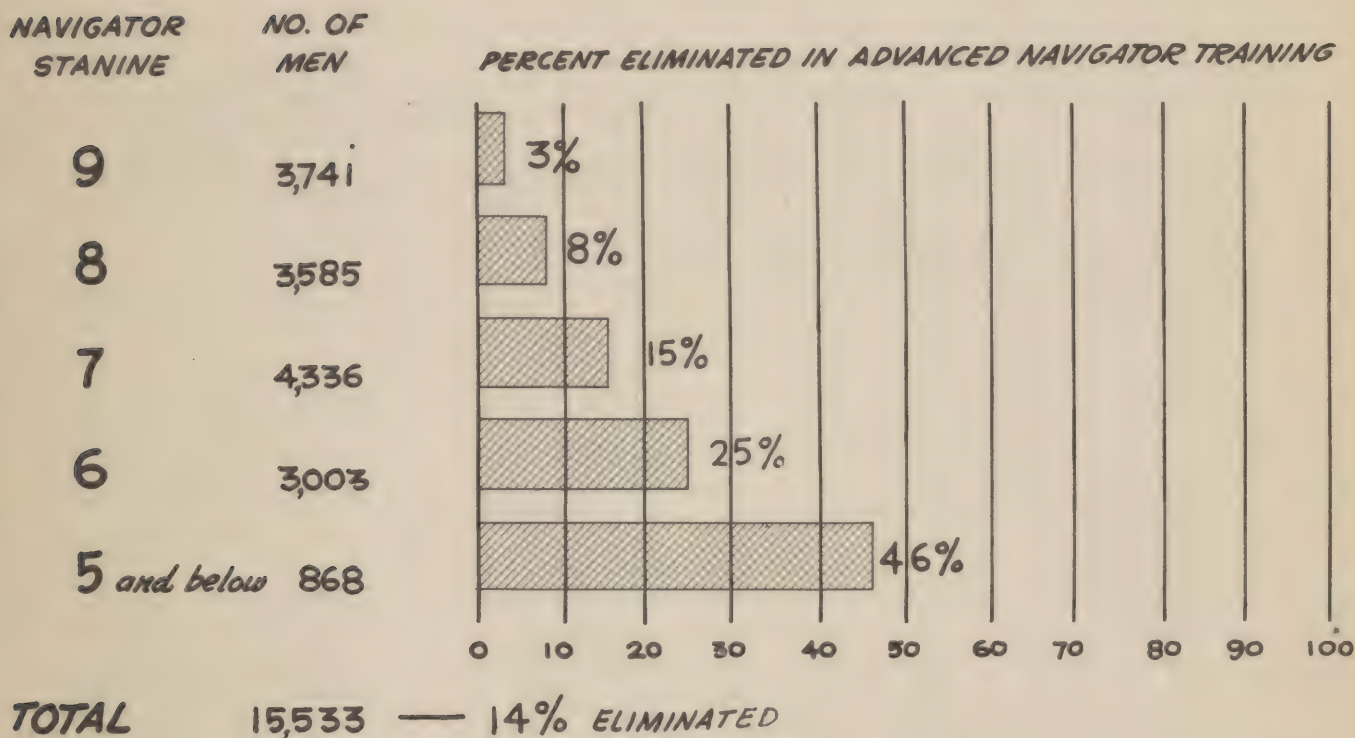
TOTAL 185,367 — 24% ELIMINATED

THE BARS INDICATE THE PROPORTIONS ELIMINATED AT EACH PILOT STANINE. ELIMINATION WAS FOR FLYING DEFICIENCY, FEAR AND OWN REQUEST. FLYING EXPERIENCE CREDIT IS INCLUDED IN THE STANINE SCORE. THE DATA ARE FROM CLASSES 43-F THROUGH 45-H. MEN WITH LOW STANINE SCORES ARE NOW DISQUALIFIED FOR TRAINING; MOST OF THE MEN WITH LOW STANINES INCLUDED IN THE CHART ENTERED PRIMARY SCHOOLS EARLY IN 1943.

SELECTION FOR NAVIGATOR TRAINING

A candidate with a low pilot stanine might have had a high navigator stanine. This chart shows that a candidate with a high navigator stanine had a much better chance of completing advanced navigator training than his colleague with a low navigator stanine.

THE HIGHER THE NAVIGATOR STANINE THE GREATER THE CHANCE OF SUCCESS IN ADVANCED NAVIGATOR TRAINING

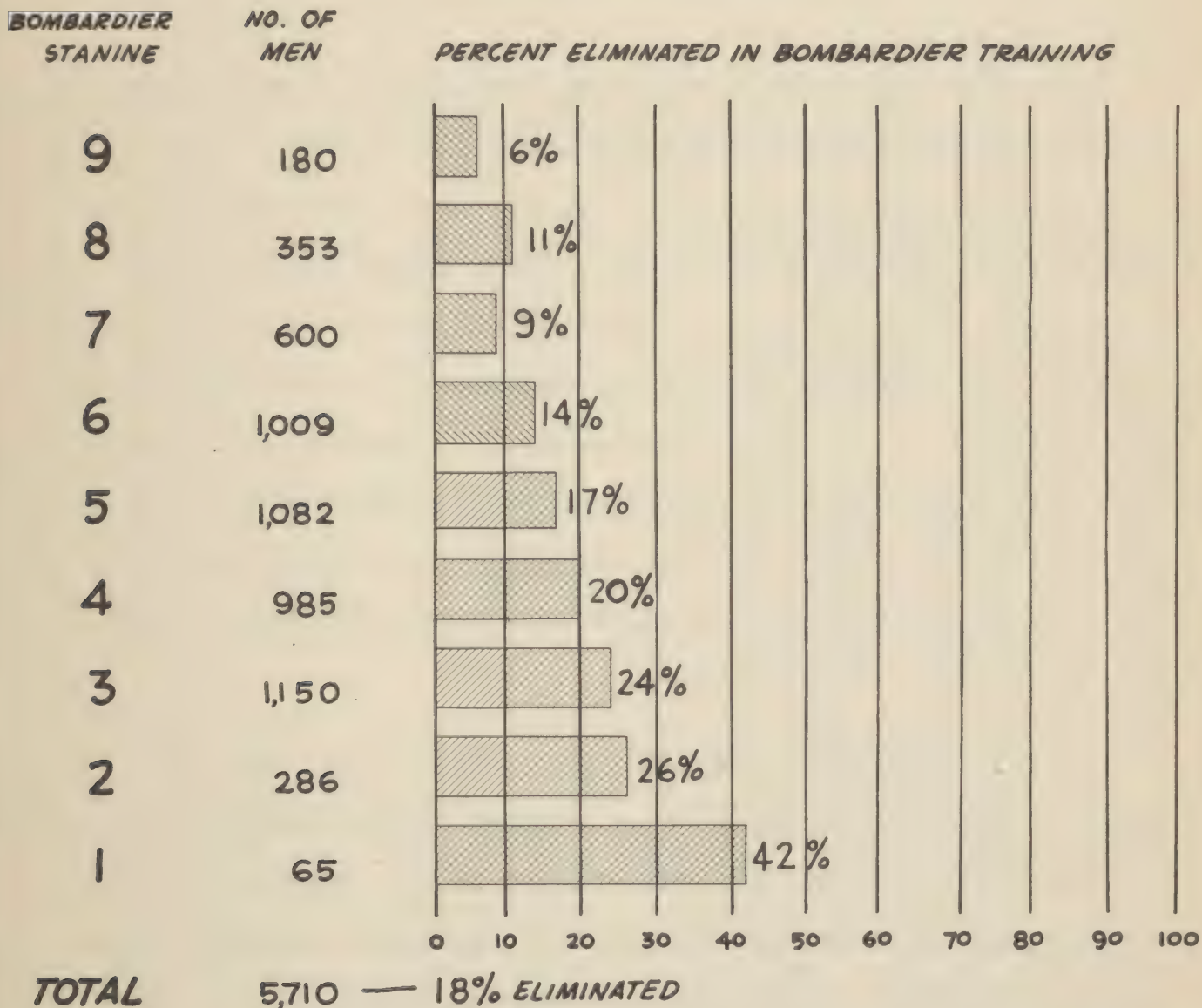


THE BARS INDICATE THE PROPORTIONS ELIMINATED AT EACH NAVIGATOR STANINE. ELIMINATION WAS FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST. ONLY NEW AVIATION CADETS ARE INCLUDED. THESE DATA ARE FROM CLASSES 43-12, 43-13, 43-14, 43-17, 43-18, AND 44-1 THROUGH 45-13.

SELECTION FOR BOMBARDIER TRAINING

The last of these three charts reveals that effective prediction for adaptability to bombardier training was obtained from the bombardier stanine.

THE HIGHER THE BOMBARDIER STANINE THE GREATER THE CHANCE OF SUCCESS IN BOMBARDIER TRAINING



THE BARS INDICATE THE PROPORTIONS ELIMINATED AT EACH BOMBARDIER STANINE. ELIMINATION WAS FOR UNSATISFACTORY PROGRESS, FEAR AND OWN REQUEST. ONLY NEW AVIATION CADETS ARE INCLUDED. THESE DATA ARE FROM CLASSES 43-8 THROUGH 43-18.

SELECTION STANDARDS

As the data on the predictive efficiency of the Classification Battery were accumulated, it became evident that the odds were against the men with low stanines. Such men are now disqualified for training in the aircrew positions for which they show little aptitude. June 1945 standards required a stanine of 7 or above to qualify for bombardier, navigator, or pilot training. Thus, since there were more candidates for aircrew duty than were needed or could be trained, the Aircrew Classification Battery was not only used to classify men for training in the different aircrew positions, but also to weed out the poorest investments.

The disqualified men were not wasted. They went into types of training in which their chances of success were better and the probabilities of a good return on the investment were greater. They became ground officers, gunners, mechanics and radio operators. A good mechanic was a greater asset to himself and to the Air Forces than an eliminated pilot.

PSYCHOLOGICAL CHARACTERISTICS
OF
SUCCESSFUL AIRCREW CANDIDATES

APTITUDES AND ABILITIES

How does it happen that a combined score (stanine) derived from a group of tests administered in eight hours could predict the outcome of many months of complicated training, climaxed by graduation or elimination, a long time after the testing had taken place?

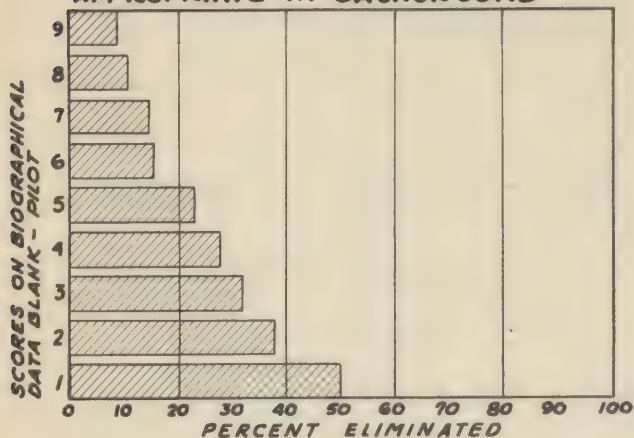
To answer this question, we must turn the clock back to July 1941 when the Aviation Psychology Program was first handed the problem of selecting the best possible candidates for aircrew training. It was decided at the outset that the first step the groundwork for efficient predictions, was to find out what had to be predicted. What does a cadet do in pilot training and what kinds of abilities or aptitudes must he have to do it well? Psychologists, working with specialists in pilot training, drew up a tentative list of aptitudes. Then tests were constructed, designed to measure these aptitudes. That was only the beginning. Now it remained to be determined which of the tests worked. They were administered to large groups of cadets before they received any training. When these men were graduated the test results were compared with their training records. If high scores were related to success in training and low scores to elimination, the test satisfied scientific standards. Such tests were incorporated into a battery. Poor predictors were discarded. The process of research, test

development and construction was continuous. New and better tests were frequently added to the original battery or substituted for less effective ones, thus constantly increasing the predictive efficiency of the stanines.

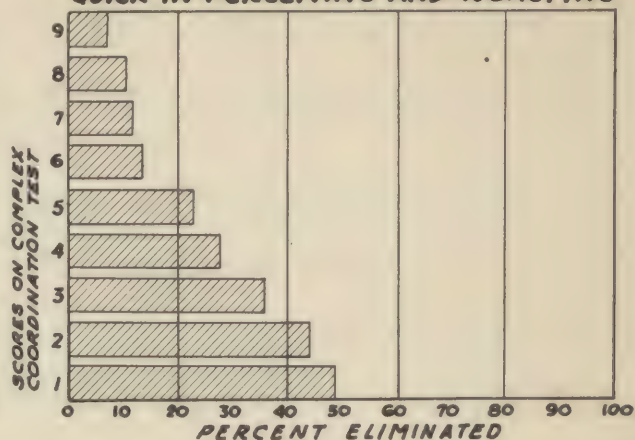
These charts present some of the most important requirements for success as pilots and navigators, respectively, and show how some of the individual tests that measure them can predict success or failure in training. If the tests are good the battery will be better.

SUCCESSFUL PILOTS ARE LIKELY TO BE...

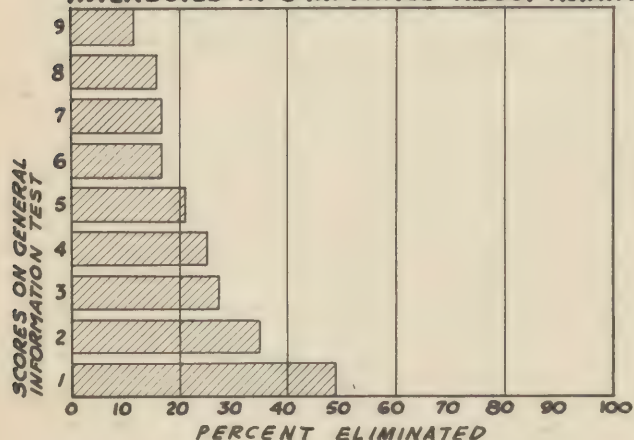
APPROPRIATE IN BACKGROUND



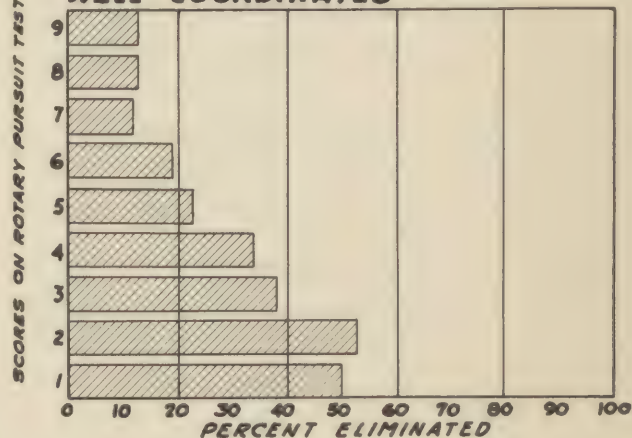
QUICK IN PERCEIVING AND REACTING



INTERESTED IN & INFORMED ABOUT AVIATION

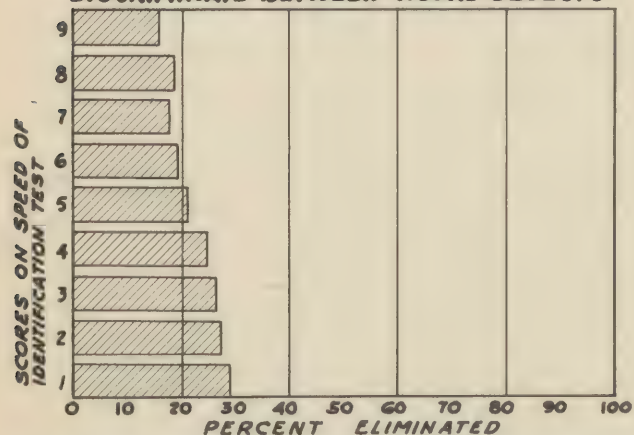


WELL COORDINATED

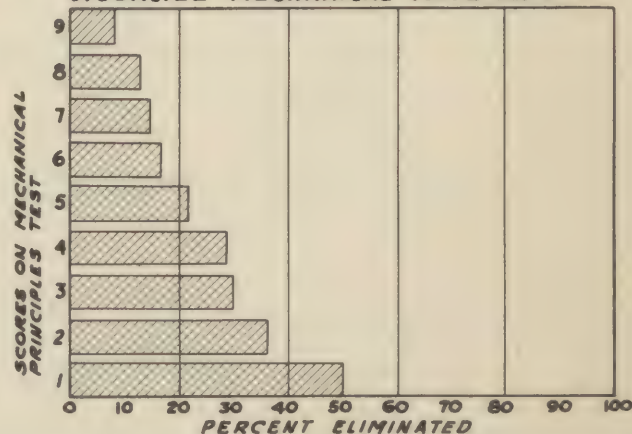


HAVE SUPERIOR ABILITY TO....

DISCRIMINATE BETWEEN VISUAL OBJECTS

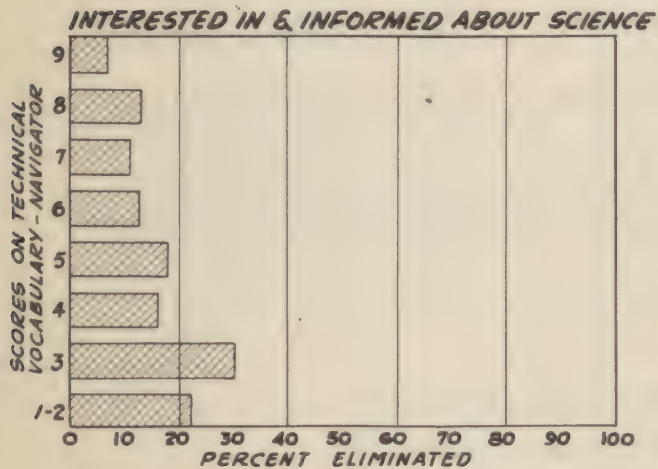
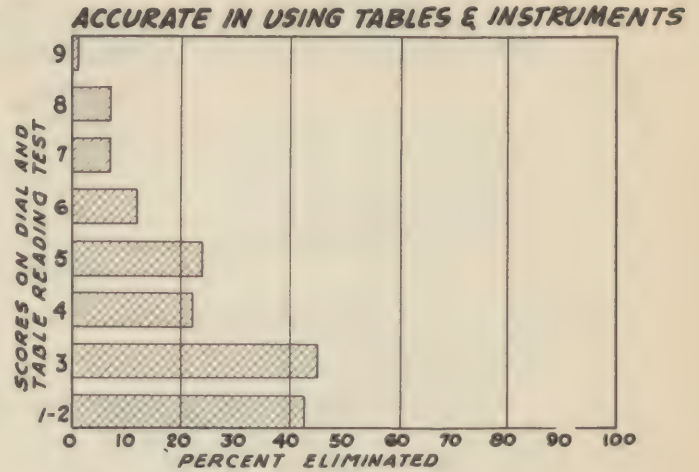
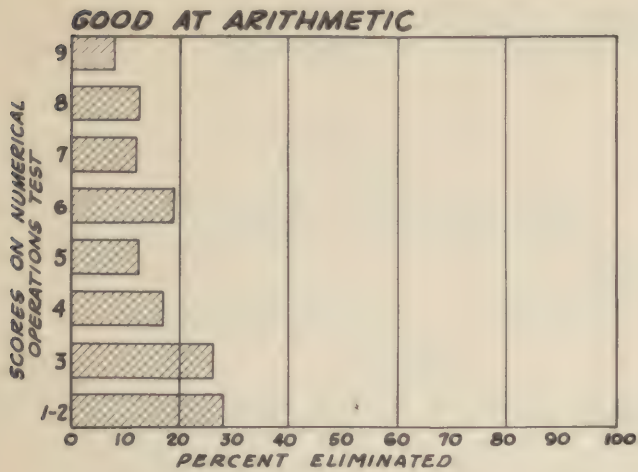


VISUALIZE MECHANICAL MOVEMENTS

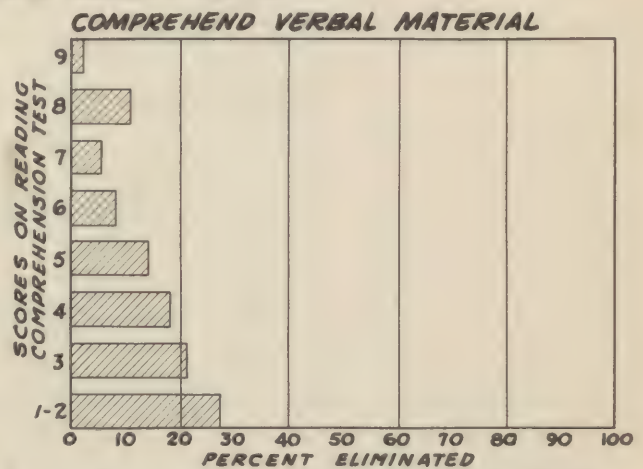
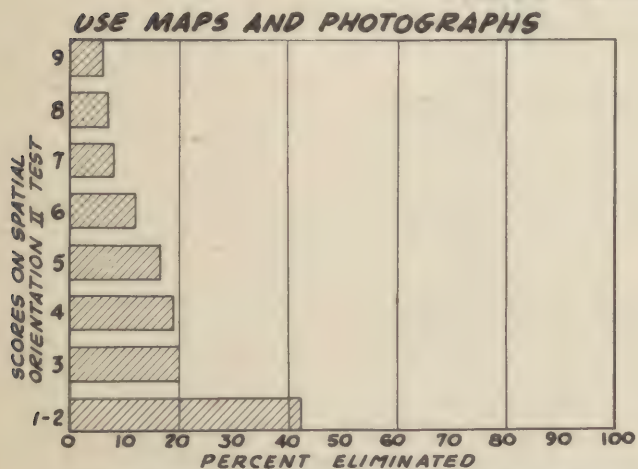


EACH BAR REPRESENTS THE PERCENT OF PILOTS ELIMINATED IN CLASS 44E THROUGH ADVANCED TRAINING AT EACH SCORING LEVEL FOR EACH AT THE TESTS REPRESENTED. TOTAL NO. 7164, NO. ELIMINATED-1585. CADETS WITH PREVIOUS FLYING EXPERIENCE ARE NOT INCLUDED. ELIMINATION IS FOR FLYING DEFICIENCY, FEAR OR OWN REQUEST. THESE TESTS ARE UTILIZED AS BEING LARGELY REPRESENTATIVE OF THE FACTORS FOUND TO BE IMPORTANT FOR PILOTS. THEY DO NOT INCLUDE THE WHOLE BATTERY WEIGHTED FOR PILOTS NOR ARE THEY PURE MEASURES OF THE FACTORS INDICATED.

SUCCESSFUL NAVIGATORS ARE LIKELY TO BE



HAVE SUPERIOR ABILITY TO....



EACH BAR REPRESENTS THE PERCENT OF NAVIGATORS ELIMINATED IN CLASSES 43-10, 11 AT EACH SCORING LEVEL FOR EACH OF THE TESTS REPRESENTED. TOTAL NO-811; NO ELIMINATED-113. ELIMINATION IS FOR UNSATISFACTORY PROGRESS, FEAR OR OWN REQUEST. THESE TEST ARE UTILIZED AS BEING LARGELY REPRESENTATIVE OF THE FACTORS FOUND TO BE IMPORTANT FOR NAVIGATORS. THEY DO NOT INCLUDE THE WHOLE BATTERY WEIGHTED FOR NAVIGATORS, NOR ARE THEY PURE MEASURES OF THE FACTORS INDICATED.

MOTIVATION

It seemed reasonable to expect that a cadet who wanted to be a pilot would work harder, longer and with more enthusiasm at the job of becoming one than the man who preferred to be a navigator. Therefore, at the time the potential cadet was tested, he was asked to indicate which aircrew position he preferred. The chart shows that the expectation was justified.

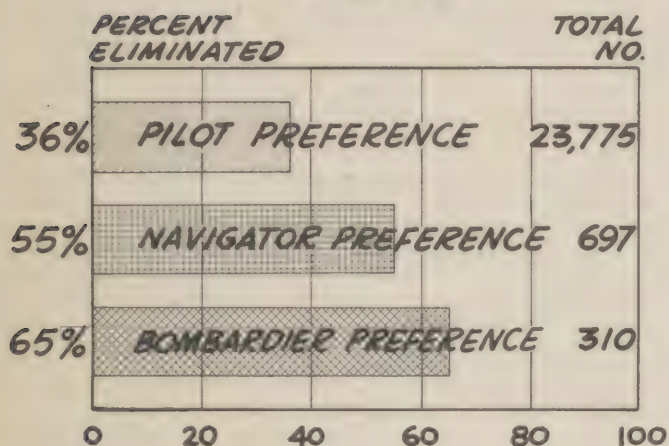
CADETS WHO WERE MOST SUCCESSFUL

IN

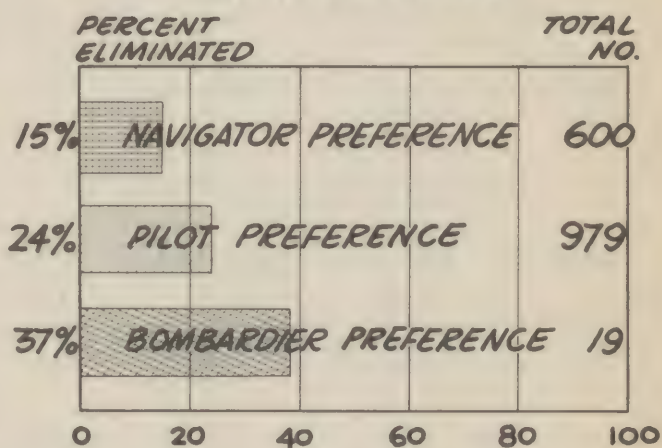
PRIMARY PILOT TRAINING

NAVIGATOR TRAINING

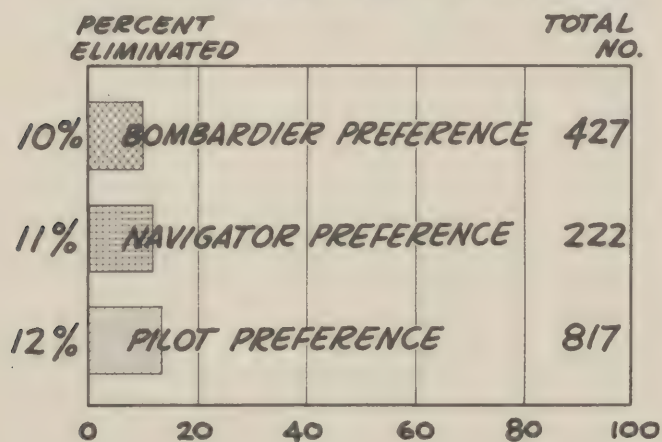
PREFERRED TO BE PILOTS






PREFERRED TO BE NAVIGATORS



THERE WAS NO CLEAR RELATION BETWEEN SUCCESS AND PREFERENCE IN BOMBARDIER TRAINING



THESE DATA ARE FROM PILOT CLASSES 43F, 43G, AND 43H. NAVIGATOR CLASSES 43-12 THROUGH 43-15, BOMBARDIER CLASSES 43-15 THROUGH 44-1

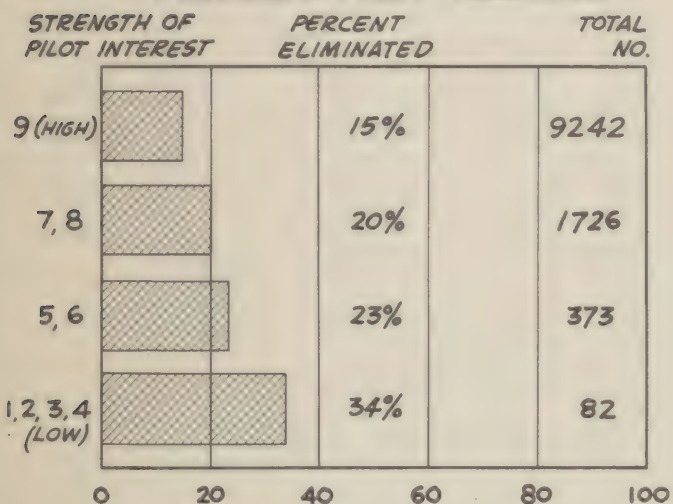
-  FIRST PREFERENCE FOR PILOT TRAINING
-  FIRST PREFERENCE FOR NAVIGATOR TRAINING
-  FIRST PREFERENCE FOR BOMBARDIER TRAINING

Another measure of motivation was the degree of interest felt in each of the aircrew positions indicated by the cadet on a nine point scale. The chart shows that the more interested men tended to be more successful.

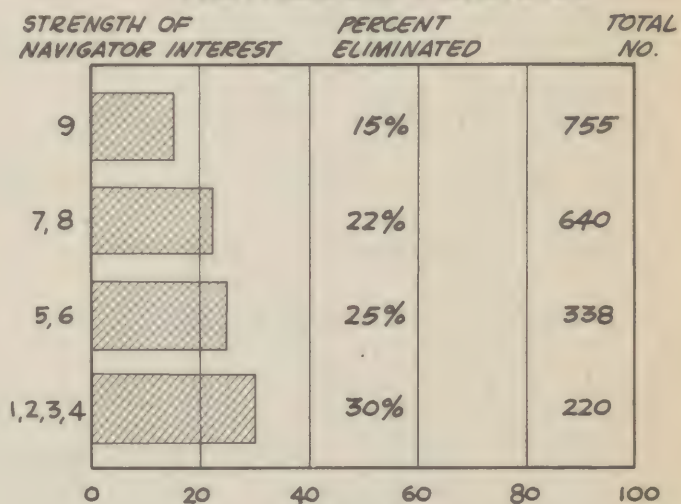
These data indicate that motivation needed to be considered in classification, especially in cases where a cadet qualified for more than one type of training.

CADETS WHO WERE MOST SUCCESSFUL IN PILOT AND NAVIGATOR TRAINING HAD A STRONG INTEREST IN THE TYPE OF TRAINING TO WHICH THEY WERE ASSIGNED

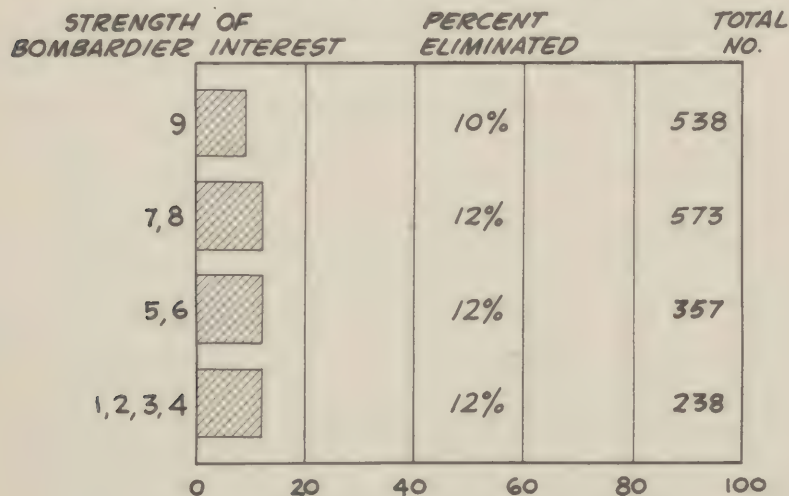
STRENGTH OF PILOT INTEREST WAS RELATED TO SUCCESS IN PRIMARY PILOT TRAINING



STRENGTH OF NAVIGATOR INTEREST WAS RELATED TO SUCCESS IN NAVIGATOR TRAINING



THERE WAS NO CLEAR RELATION BETWEEN STRENGTH OF BOMBARDIER INTEREST AND SUCCESS IN..... BOMBARDIER TRAINING



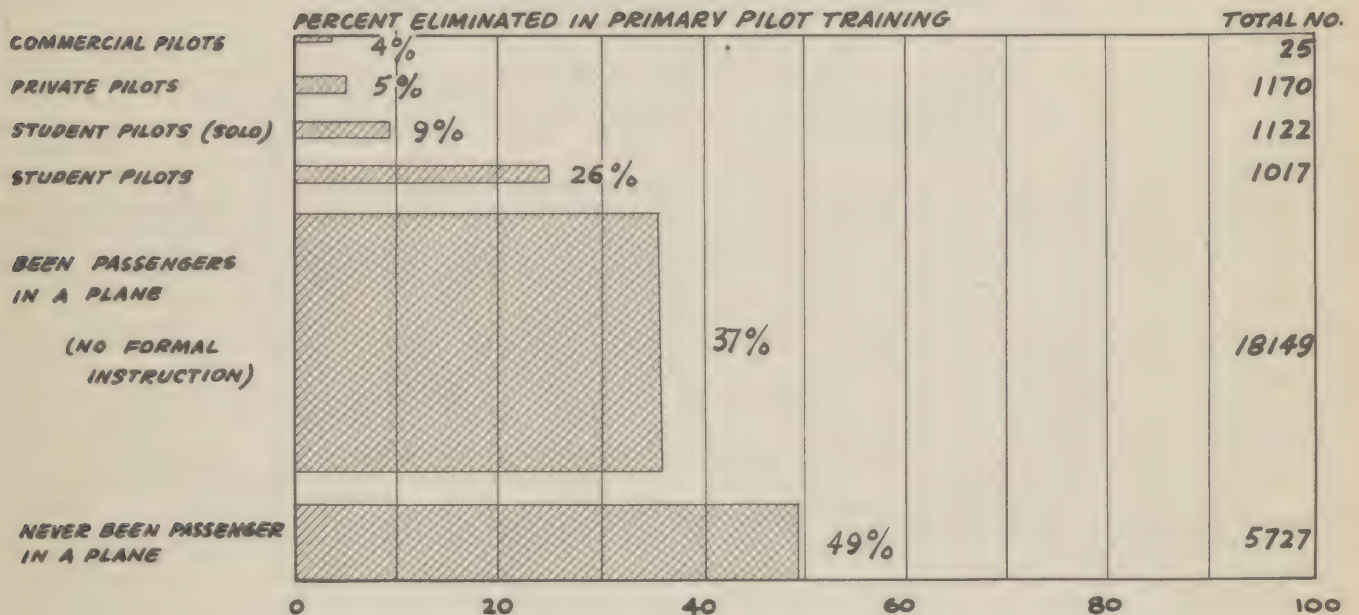
THESE DATA ARE FROM PRIMARY PILOT CLASS 44-C, NAVIGATOR CLASSES 43-12 THROUGH 43-15, BOMBARDIER CLASSES 43-15 THROUGH 44-1.

EXPERIENCE

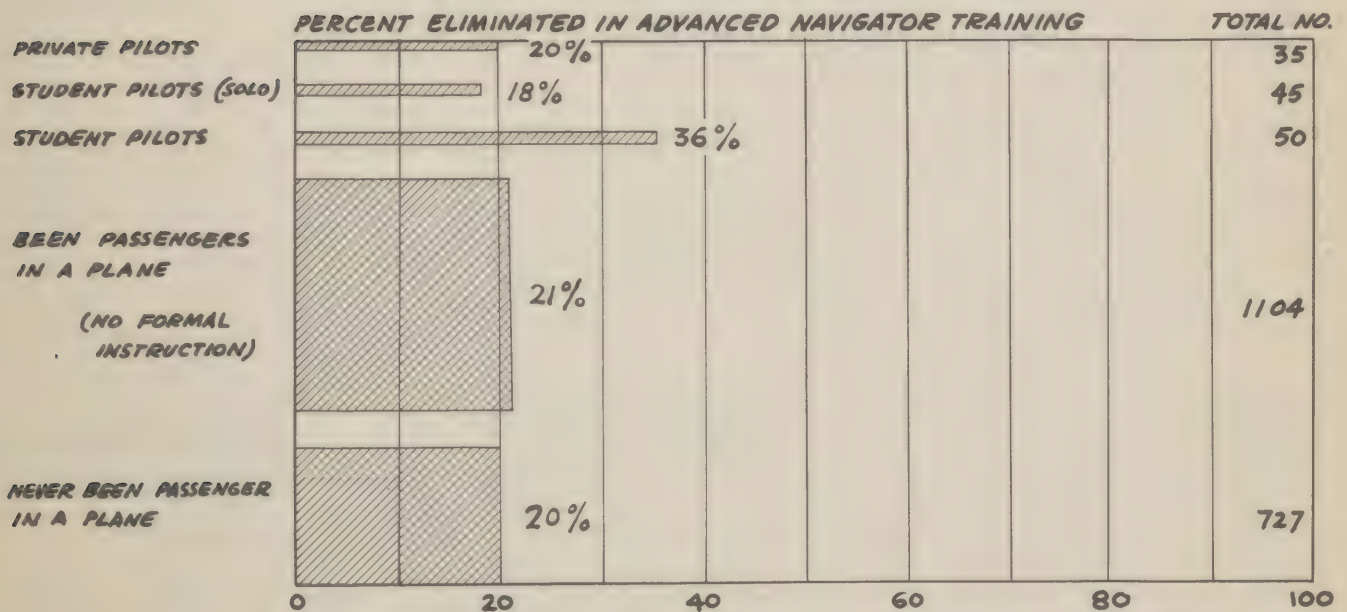
A cadet who has already learned how to fly will naturally have less to learn in pilot training than one who has never been in a plane. However, since only about 12% of the cadets in primary pilot training had previous training, the practical value of flying experience as a selective device was rather limited. It was utilized early in the program by giving bonuses to the experienced men, 2 stanine points for a solo certificate and 3 stanine points for a solo certificate plus 30 or more log hours, thus providing an augmented pilot stanine with a somewhat increased predictive power.

But as new and better tests were added to the battery, including tests of interest, information about flying, and motivation, it was found that the qualities and knowledge associated with previous flying experience were being measured in the tests. The relation between success in pilot training and the stanine increased. Bonuses granted for previous flying experience no longer added to the predictive efficiency of the stanine and were therefore discontinued.

THE MORE PREVIOUS FLYING EXPERIENCE A CADET HAD...THE MORE LIKELY HE WAS TO SUCCEED IN PRIMARY PILOT TRAINING



PREVIOUS FLYING EXPERIENCE WAS NOT RELATED TO SUCCESS IN NAVIGATOR TRAINING



THE BREADTH OF THE BARS IS PROPORTIONAL TO THE NUMBER IN EACH CATEGORY.
PILOT DATA FROM CLASSES 43-F, 43-G AND 43-H. NAVIGATOR DATA FROM
CLASSES 43-12 THROUGH 43-15.

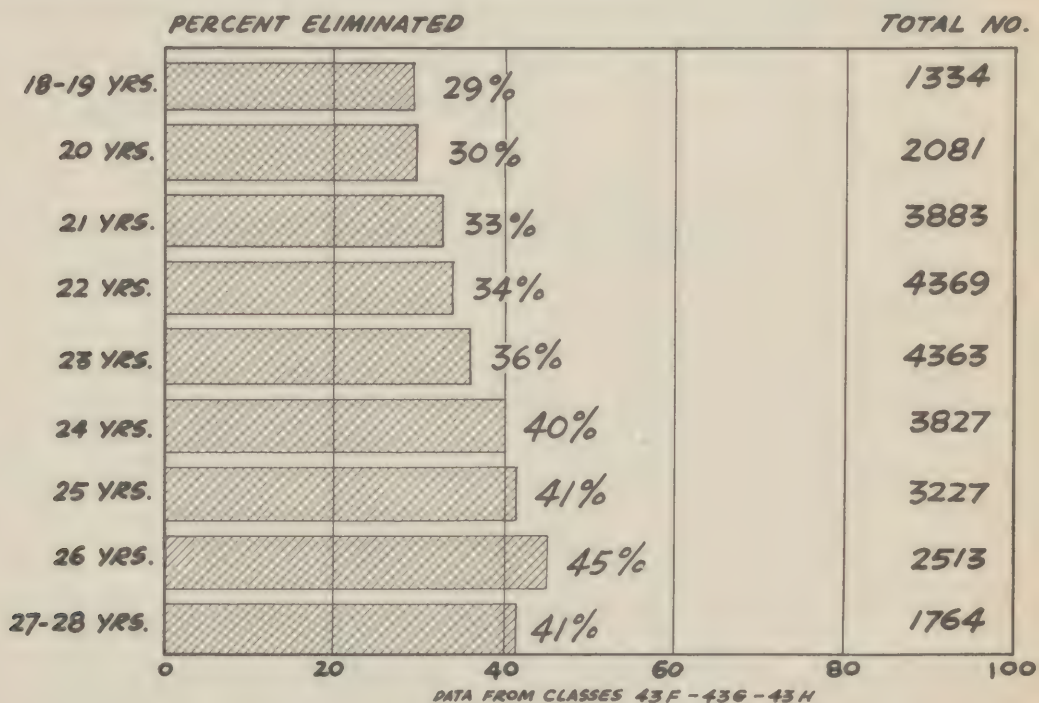
BACKGROUND FACTORS

It can be seen that after pilots had been screened, a slight relationship remained between success in pilot training and age, education, and marital status. But the relationship was slight and any use of these factors as a basis for selection would have eliminated a great many potentially successful pilots along with the potential failures.

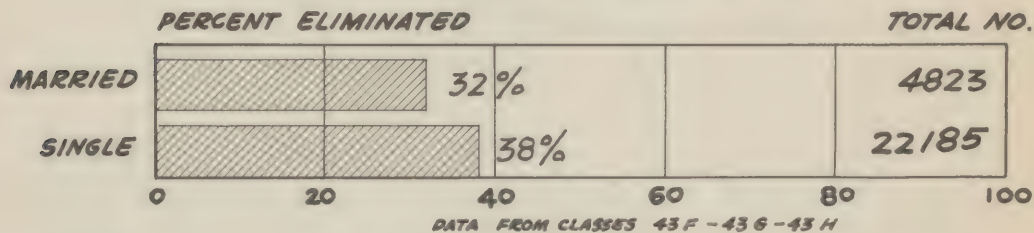
AMONG CADETS WHO HAD BEEN SCREENED FOR APTITUDE

**THESE MEN HAD A SLIGHTLY BETTER CHANCE
OF SUCCEEDING IN
PRIMARY PILOT TRAINING**

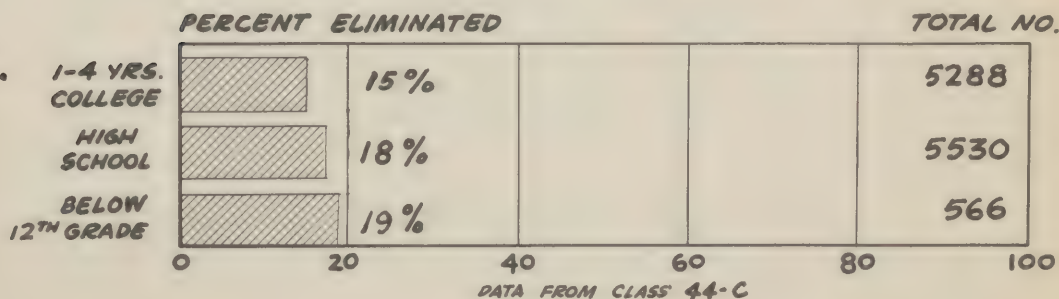
YOUNGER.....



MARRIED.....



MORE EDUCATED...



RECOMMENDATIONS FOR ASSIGNMENT

Recommendations for assignment of cadets to the different aircrew positions or to ground duty were made upon the basis of the stanine (aptitude score) obtained, augmented by consideration of the experience and motivation of the cadets.

Due largely to local quota conditions, there were some instances in which men recommended by the Psychological Research Units for bombardier or navigator training were assigned to pilot training. It can be seen that their elimination rate was almost twice as high as the men assigned according to recommendation.

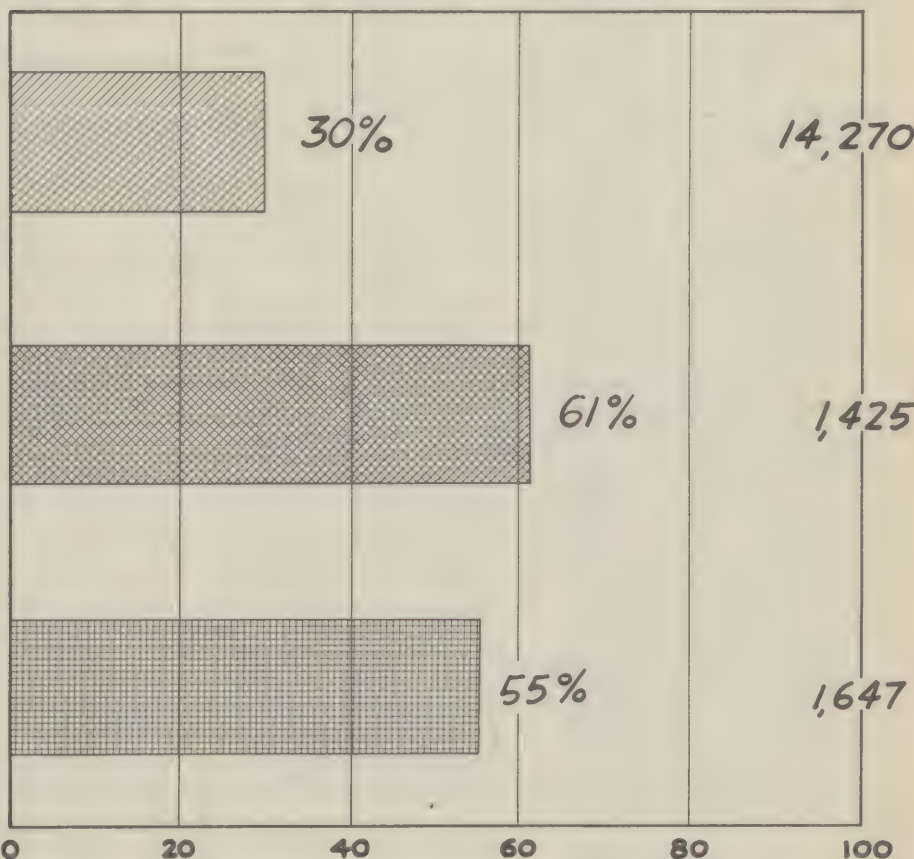
THE ELIMINATION RATE WAS ALMOST TWICE AS HIGH
AMONG CADETS IN PILOT TRAINING WHO WERE
RECOMMENDED FOR BOMBARDIER OR NAVIGATOR
TRAINING AS AMONG THOSE WHO WERE RECOMMENDED
FOR PILOT TRAINING

PSYCHOLOGICAL RESEARCH
UNIT RECOMMENDATION

PERCENT ELIMINATED IN PRIMARY PILOT TRAINING

TOTAL
NO

PILOT



BOMBARDIER

NAVIGATOR

DATA FROM CLASSES 43 F - 43 G - 43 H

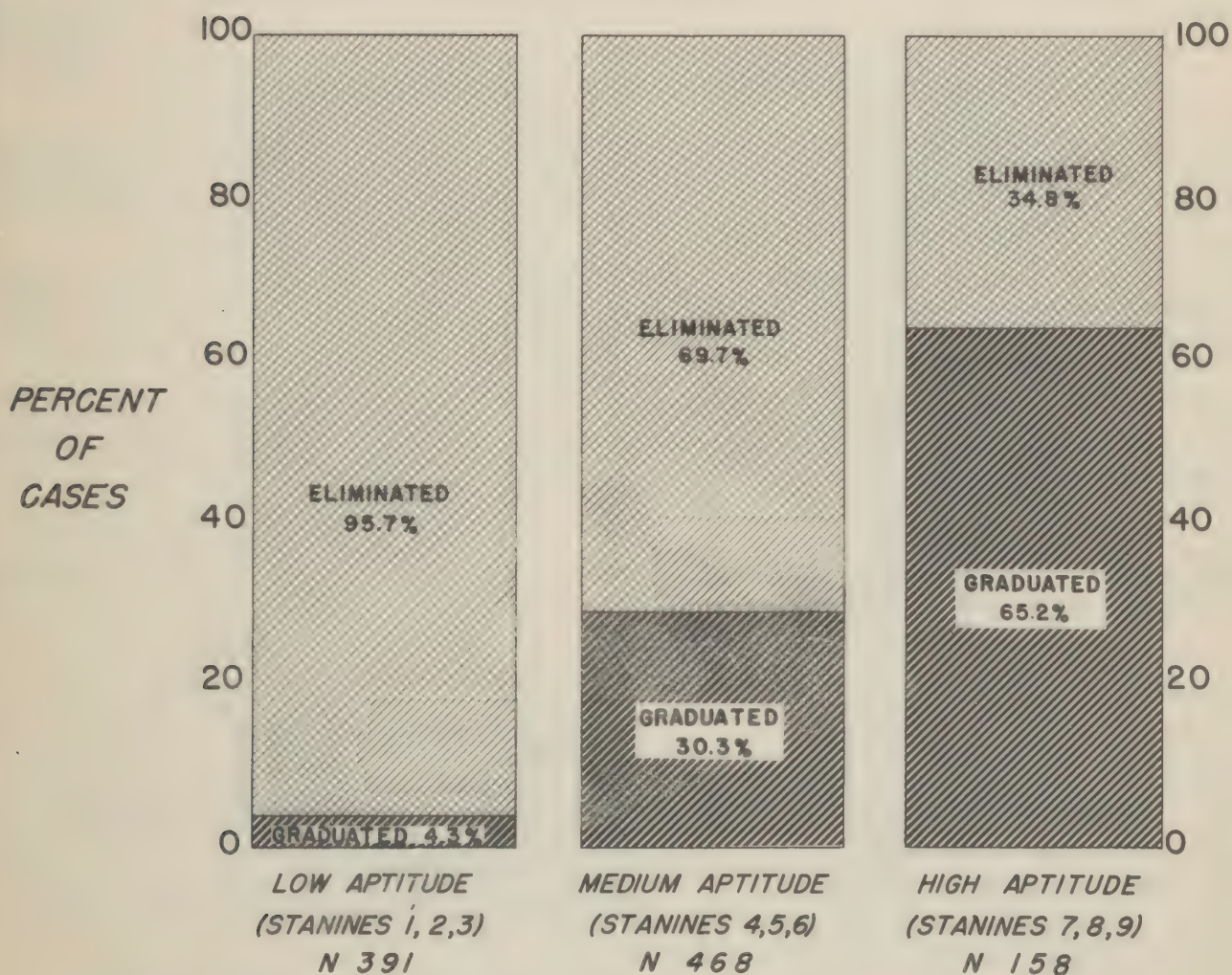
THE EXPERIMENTAL GROUP

From late in 1943 through early 1944 a special experimental group of approximately 1000 men, recruited from the regular sources, were permitted to enter pilot training along with the thousands of regular cadets. The experimental group took the Qualifying and Classification tests but all of the men were assigned to pilot training whether or not they received sufficiently high scores to qualify them for such training. They were recruited from all over the country and their training and assignments were scattered throughout the pilot training schools, mixed unrecognizably with the other cadets. Studying this group enables us to see what would have happened if there had been no selection in effect as well as to make other analyses, several of which are presented in the following charts.

MEN WITH LOW PILOT APTITUDE SCORES (STANINES)
ON THE AAF AIRCREW CLASSIFICATION TESTS
ARE VERY POOR PROSPECTS FOR PILOT TRAINING

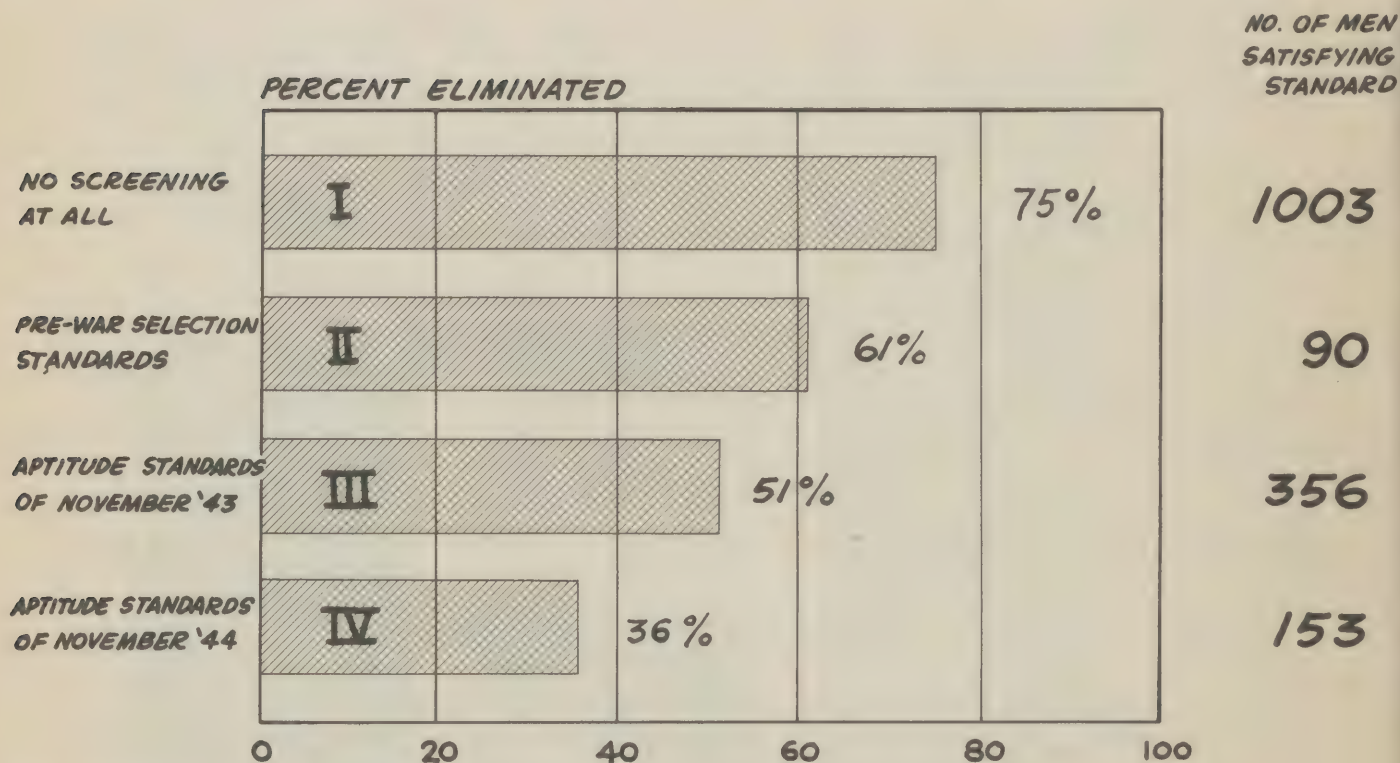
EXPERIMENTAL GROUP

SUCCESS IN COMPLETE FLYING TRAINING



A COMPARISON OF THE ELIMINATION RATES IN COMPLETE PILOT TRAINING ACCORDING TO FOUR DIFFERENT STANDARDS OF SELECTION

*IN AN EXPERIMENTAL GROUP OF 1000 MEN
WHO WERE PERMITTED TO ENTER PILOT TRAINING IN
1943 REGARDLESS OF WHAT SCORES
THEY OBTAINED ON THE SELECTION TESTS*



DESCRIPTION OF STANDARDS:

- I.... NO SELECTION FOR APTITUDE .
- II.... TWO YEARS OR MORE OF COLLEGE AND PASSING THE ADAPTABILITY RATING FOR MILITARY AERONAUTICS MADE BY FLIGHT SURGEONS.
- III.... A SCORE OF 180 OR OVER ON THE AAF QUALIFYING EXAMINATION AND A PILOT STANINE OF 5 OR OVER.
- IV.... A SCORE OF 180 OR OVER ON THE AAF QUALIFYING EXAMINATION AND A PILOT STANINE OF 7 OR OVER.

THE HIGHER THE ENTRANCE STANDARDS

THE LOWER THE TRAINING COST BUT...

THE GREATER THE REQUIRED SUPPLY OF CANDIDATES

ONE MUST HAVE AS A
SUPPLY OF APPLICANTS FOR
TRAINING (AVAILABLE FOR APPLICATION
OF SCREENING PROCEDURES)

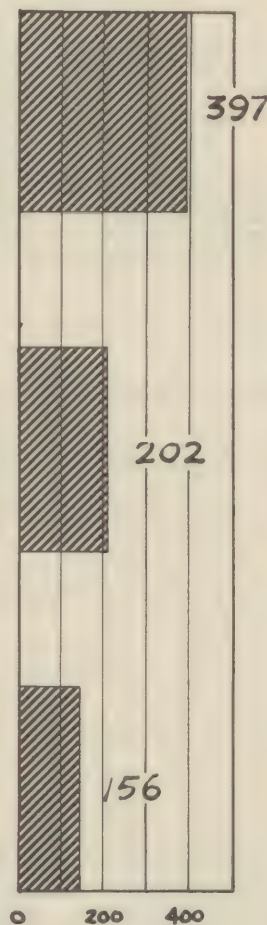
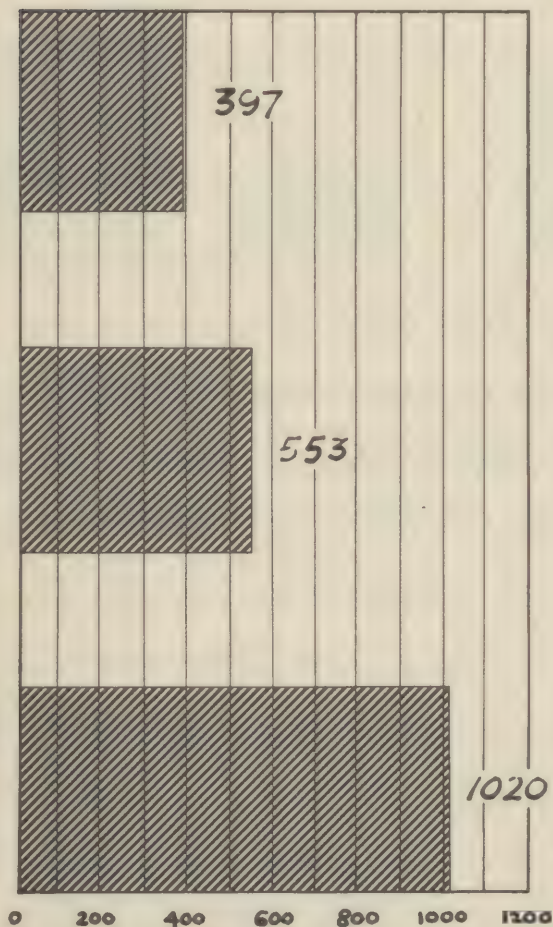
ONE MUST
ENTER INTO
TRAINING

TO GET 100
GRADUATES
FROM PILOT
TRAINING.

USING NO
SCREENING
PROCEDURES

SCREENING ON
AAFQE SCORE
OF 180 AND
MINIMUM
PILOT STANINE
OF 5

SCREENING ON
AAFQE SCORE
OF 180 AND
MINIMUM
PILOT STANINE
OF 7



WEST POINT STUDIES

This chart summarizes data on success in primary pilot training of U. S. Military Cadets and of Aviation Cadets trained in the same classes and schools. These results are of special interest because they make possible a comparison of the procedures at West Point with the increasing selectivity which operated in the case of Aviation Cadets.

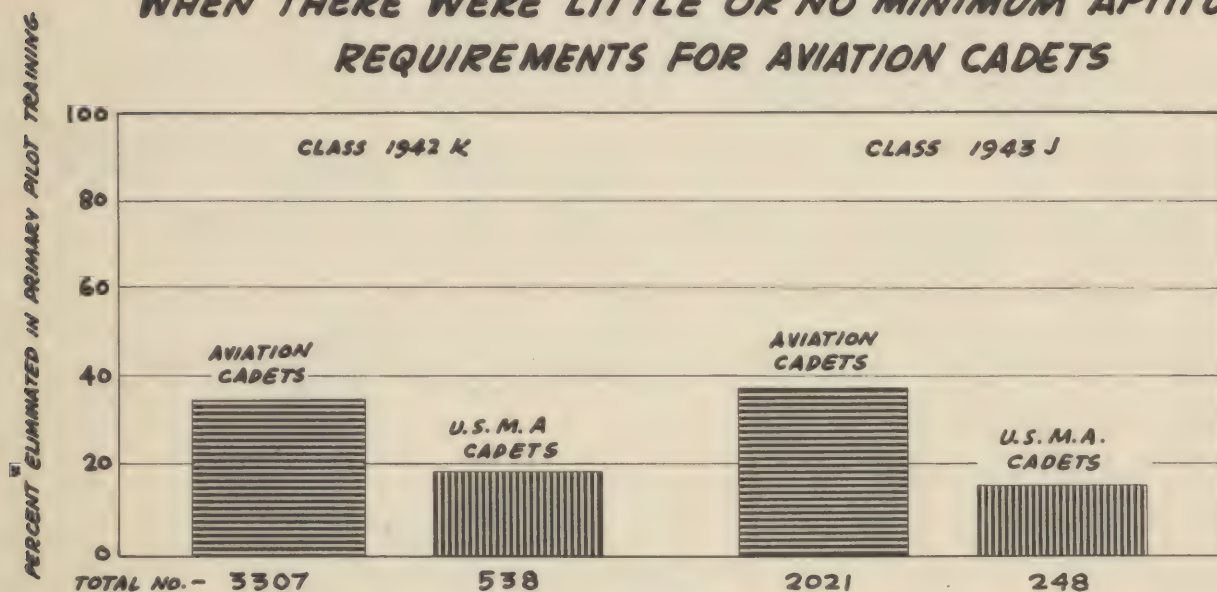
In the case of Military Academy Cadets, the uniform policy has been to give flight training to any cadet who elects it and who passes the physical examination. In the case of Aviation Cadets, the selection standards changed from class to class and became progressively more severe. In class 42-K some men were qualified on the basis of two years of college or the equivalent and some on the AAF Qualifying Examination but none were required to meet any further minimum pilot aptitude score on the AAF Aircrew Classification Tests. All later classes were screened on the AAF Qualifying Examination. In addition, a large majority of the men with pilot stanines of 1 and 2 were being disqualified for pilot training at the time that class 43-J was being tested. During the period while class 44-J was being selected a minimum stanine of 4, 5, and 6 was in effect for pilot training. Aviation Cadets in class 45-H were required to have a minimum pilot stanine of 6 in order to qualify.

IN PRIMARY PILOT TRAINING

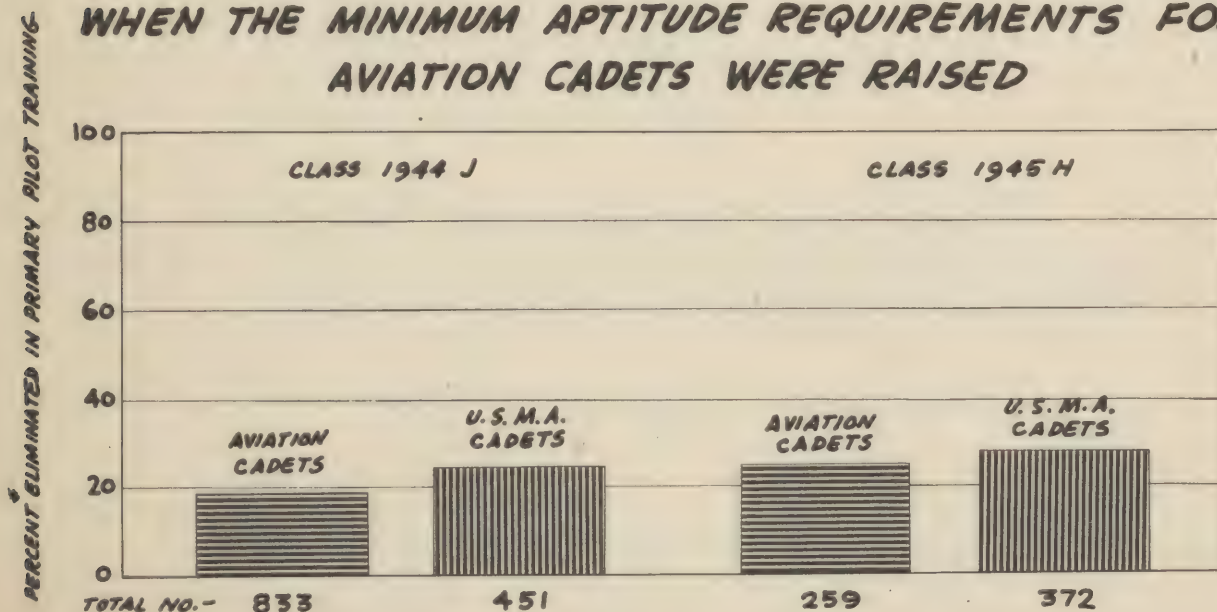
AVIATION CADETS AS COMPARED WITH WEST POINT CADETS

WERE

**CONSIDERABLY LESS SUCCESSFUL IN THE EARLY CLASSES
WHEN THERE WERE LITTLE OR NO MINIMUM APTITUDE
REQUIREMENTS FOR AVIATION CADETS**



**SLIGHTLY MORE SUCCESSFUL IN THE LATER CLASSES
WHEN THE MINIMUM APTITUDE REQUIREMENTS FOR
AVIATION CADETS WERE RAISED**



* ELIMINATION IS FOR FLYING DEFICIENCY, FEAR AND OWN REQUEST

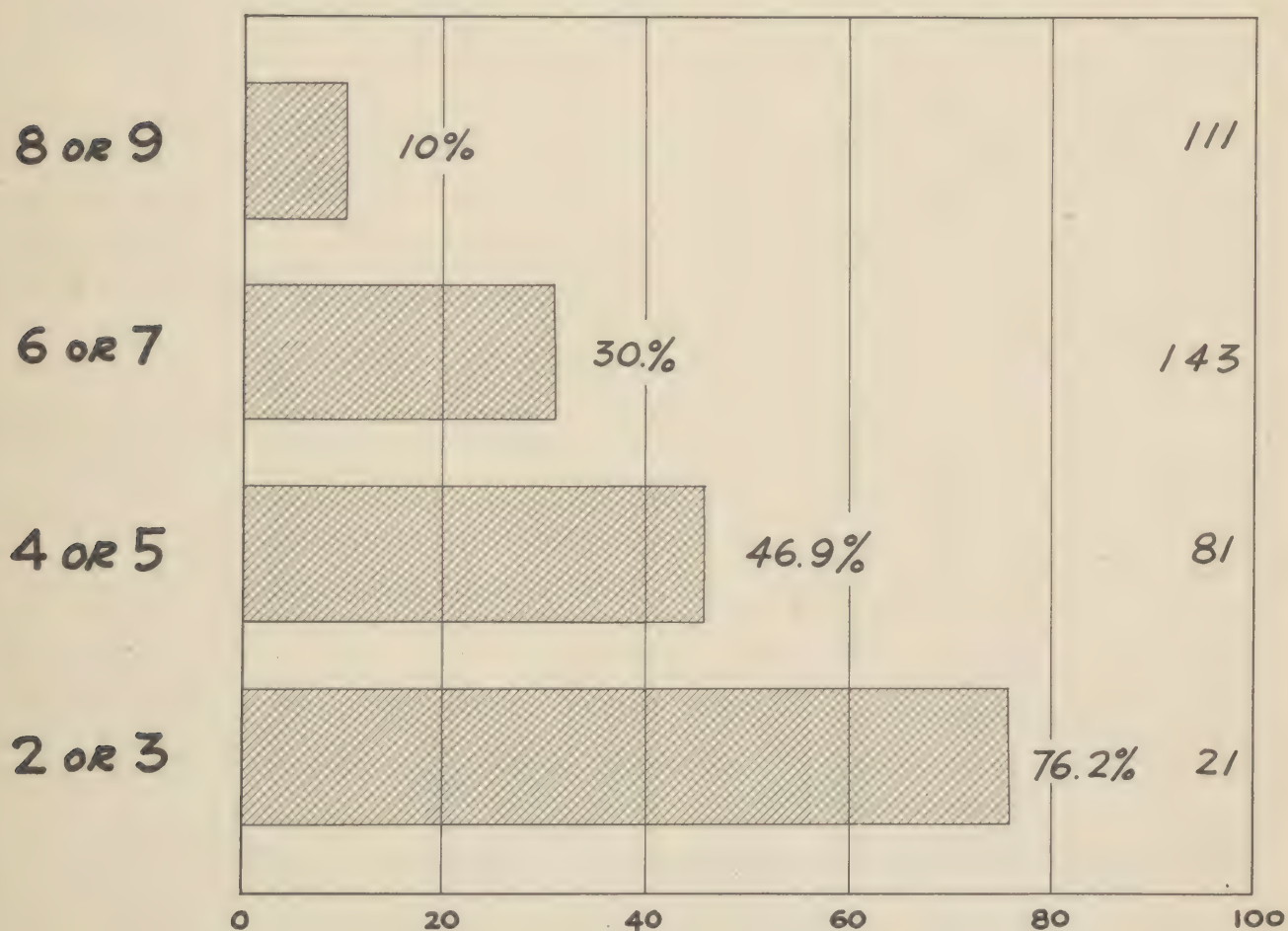
The AAF Aircrew Classification Battery was administered to the class of 1946 at the U. S. Military Academy in the fall of 1944, several months before they entered flying training. This is the class which received primary pilot training in class 45-H. The chart shows the elimination rate for West Point cadets at each stanine score. These data show clearly that the pilot stanine is effective in predicting training success for West Point Cadets, as it has been shown to be for Aviation Cadets. For those USMA Cadets who met the Aviation Cadet standard (stanine of 6) which was effective when the Aviation Cadets in 44-J and 45-H were qualified, the elimination rate is only 21.7 percent as compared with 30.2 percent for the class as a whole.

THE PILOT STANINE WAS EFFECTIVE IN PREDICTING SUCCESS IN PILOT TRAINING FOR WEST POINT CADETS

STANINE
SCORE

PERCENT ELIMINATED

NO. OF MEN



THIS IS THE CLASS WHICH RECEIVED PRIMARY PILOT TRAINING IN CLASS 45 H

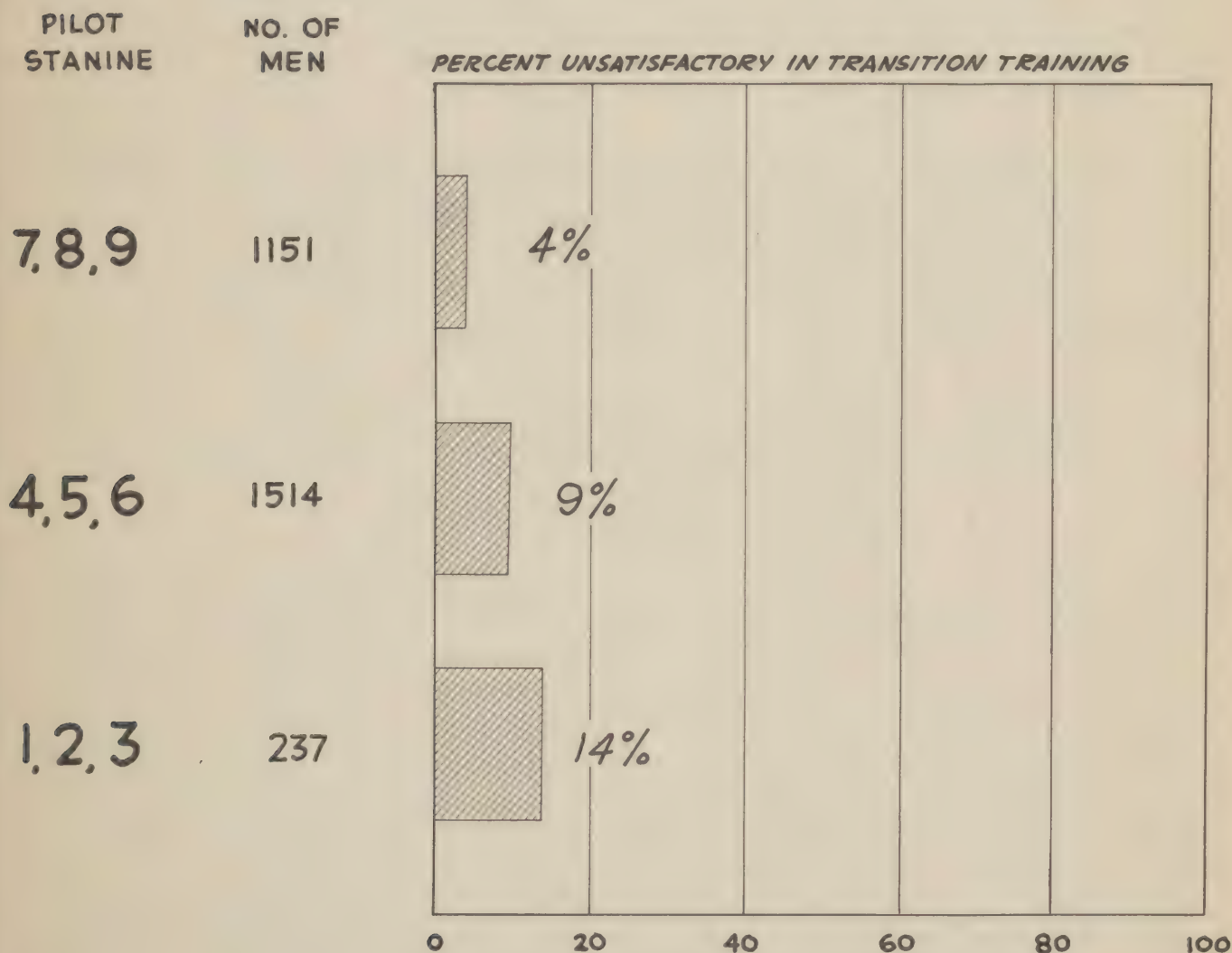
TRANSITION AND OPERATIONAL
TRAINING

The ability of the aptitude scores to predict success in early phases of training has been discussed at some length. Now we are ready to pursue the pilot's career after he had received his wings, through the intervening training periods before he entered combat.

TRANSITION TRAINING

Most of these new officers entered transition training and a small portion of these entrants were reassigned because of unsatisfactory performance. The stanine continued to discriminate the better from the poorer pilots even in this highly select group.

THE HIGHER THE PILOT STANINE
THE GREATER THE CHANCES
OF SUCCESS IN
BOMBER PILOT TRANSITION TRAINING



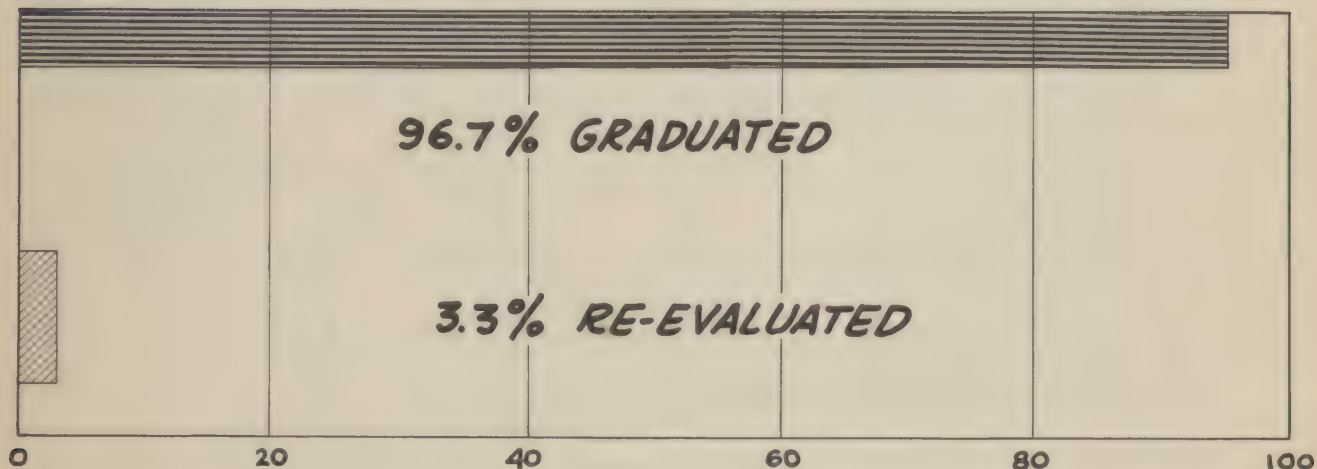
DATA BASED ON PILOTS IN CLASSES 43-D, F, AND G
AT ALL TRANSITION TRAINING SCHOOLS.

OPERATIONAL TRAINING

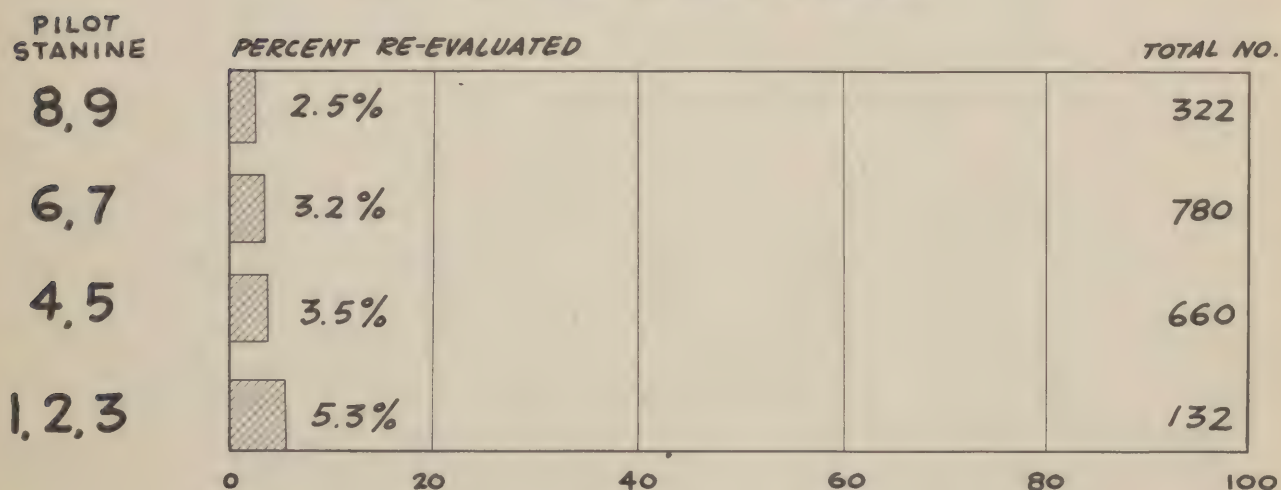
Most of the cadets who succeeded in passing transition training went into operational training with the Continental Air Forces. Here again the weeding out process continued and a small proportion of the least capable were removed from flying status by Flying Evaluation Boards. A greater proportion of the low stanine pilots were re-evaluated.

OF THE P-38 FIGHTER PILOTS IN OPERATIONAL TRAINING BETWEEN MAY 1944 & MARCH 1945

**3.3% WERE RE-EVALUATED
BY FLYING EVALUATION BOARDS**



**HIGH STANINE PILOTS WERE LESS LIKELY
TO BE RE-EVALUATED**



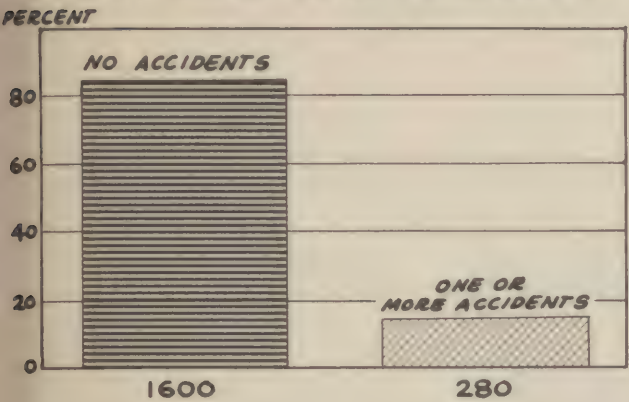
DATA FROM THE 4TH AIR FORCE. DATA FOR BOTH FIGURES WERE DRAWN FROM THE SAME POPULATION AND INCLUDE RE-EVALUATION FOR ALL REASONS.

ACCIDENTS

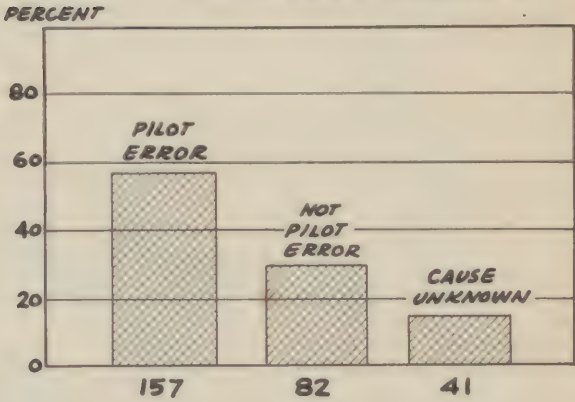
Aircraft accidents can have many causes but it is important to observe the considerable proportion attributed to pilot error. Some of these "pilot error" accidents were partly due to poor design of equipment for example, controls that were too far away to reach comfortably, or too close and too similar to another making it too easy for the pilot who wanted to put down his flaps to retract his landing gear instead. Some of the dials were so inadequately illuminated that at least one accident occurred when the pilot, using his flashlight to read a meter while taking off, spoiled his night vision and ran into a hill. Considerable research is being done on the improvement of cockpit controls and display to bring them into line with the physiological and psychological capacities of the men who pilot the planes and thus reduce the accident rate.

Another way to decrease accidents is to select men who are less likely to have accidents. According to a study conducted on 1883 P-38 fighter pilots in operational training in the Fourth Air Force, the high stanine pilots had a lower pilot error accident rate than did the low stanine pilots.

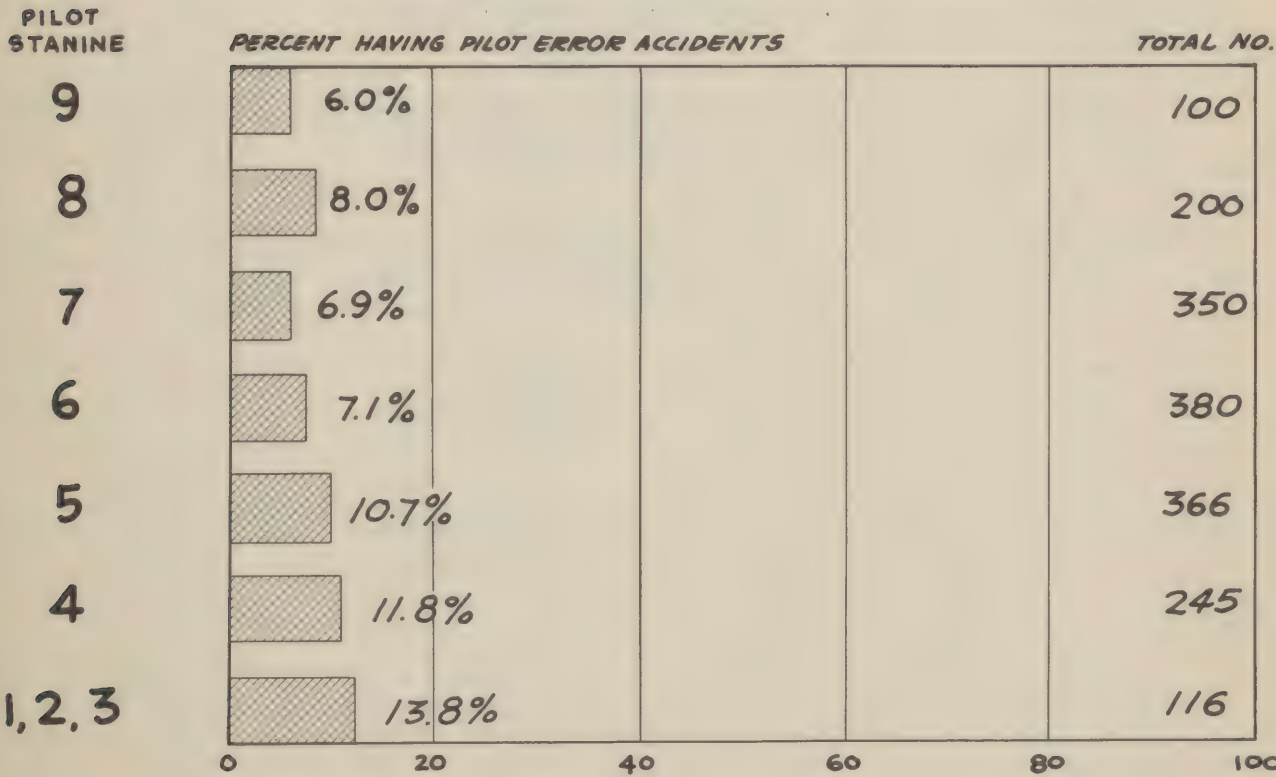
15% OF P-38 PILOTS IN OPER-
 ATIONAL TRAINING BETWEEN
 MAY 1944 & MARCH 1945 HAD
 AT LEAST ONE ACCIDENT



OVER HALF OF THESE
 ACCIDENTS WERE ATTRIBUTED
 TO PILOT ERROR



HIGH STANINE P-38 PILOTS WERE LESS LIKELY
 TO HAVE PILOT ERROR ACCIDENTS



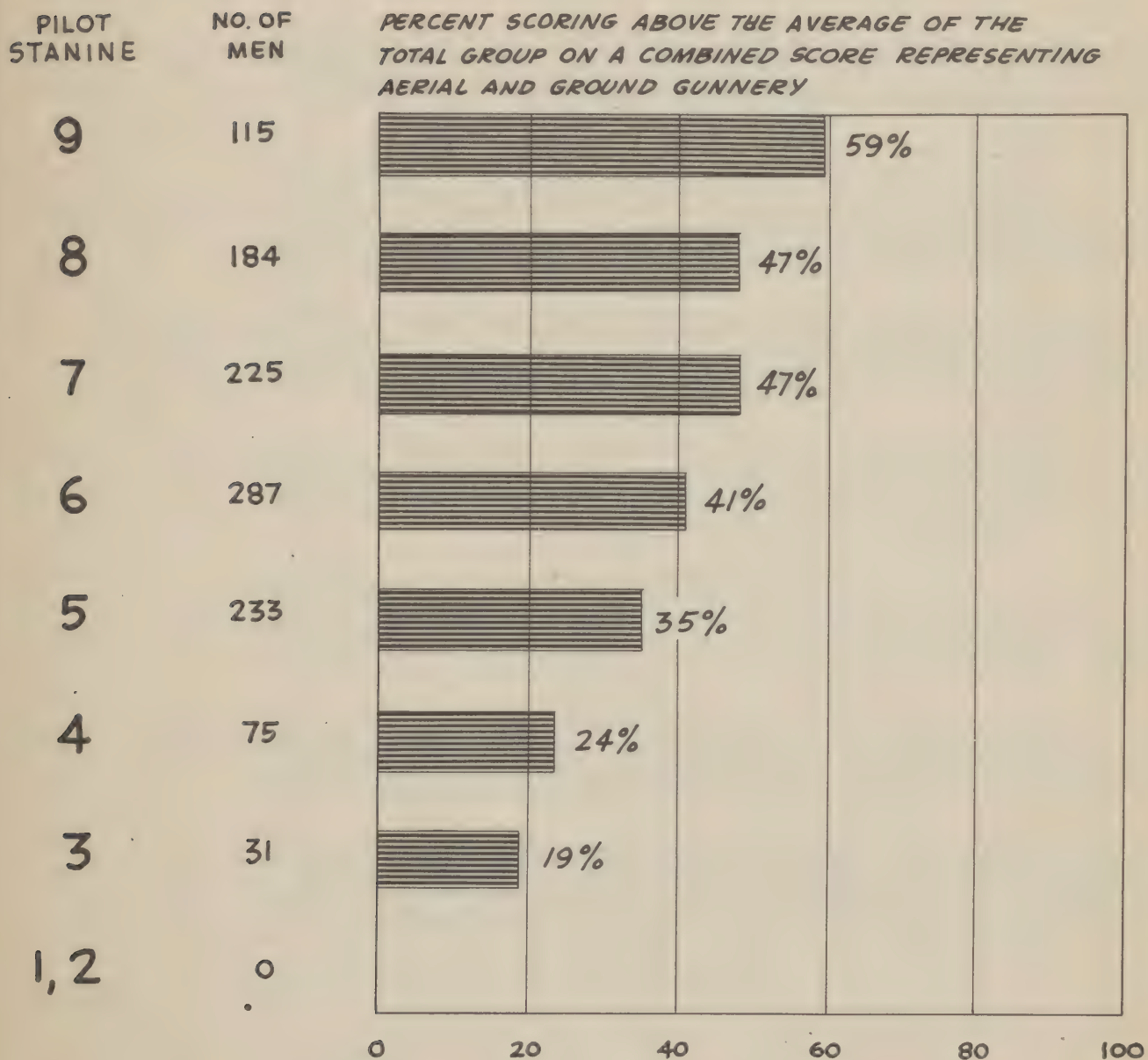
DATA FROM THE 4TH AIR FORCE. DATA FOR THE THREE FIGURES WERE
 DRAWN FROM THE SAME POPULATION. EXPERIENCE CREDIT HAS NOT BEEN
 INCLUDED IN THE STANINES.

FIXED GUNNERY

In the latter half of fighter pilot training at the operational level instruction in fixed gunnery was emphasized. The number of hits on the target divided by the number of rounds fired provided a "gunnery score," that enabled the student to tell how well he was doing and also provided a measure of his proficiency.

Aerial and ground gunnery scores for 1150 fighter pilots were collected, combined into a single score and then related to the pilot stanine. The chart shows that high stanine pilots as a group made better scores than low stanine pilots.

HIGH STANINE PILOTS WERE LIKELY TO SCORE MORE HITS ON AERIAL AND GROUND TARGETS

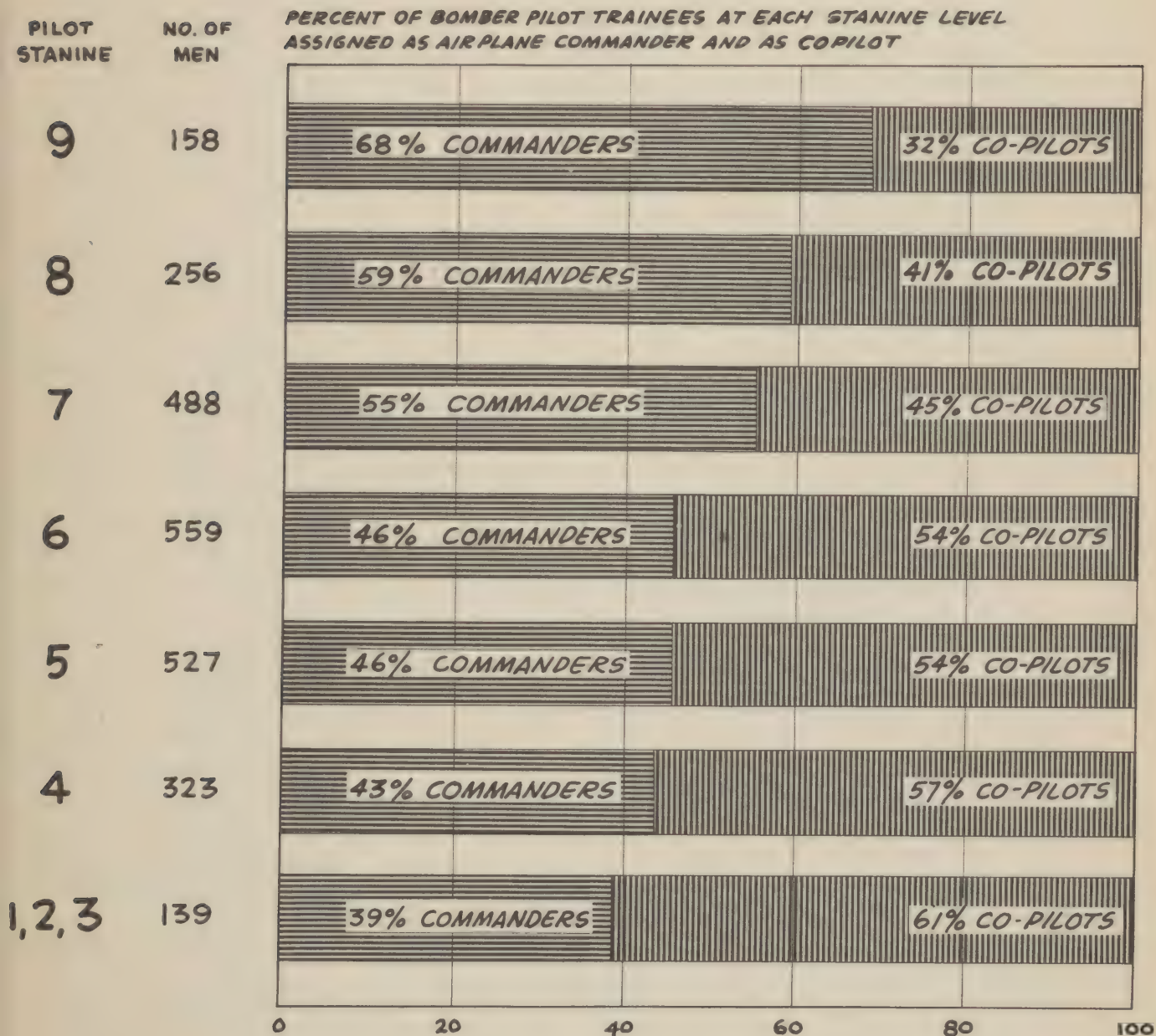


DATA COLLECTED FROM STATIONS AND COMMITMENTS IN THE
1ST FIGHTER COMMAND BETWEEN JUNE 1944 AND MARCH 1945.
ONLY NEWLY RATED PILOTS ARE INCLUDED.

PLANE COMMANDER VS. CO-PILOT

Training personnel tried to assign the most proficient pilots to be plane commanders and to utilize the others as co-pilots. The Fourth Air Force study on 1218 B-24 airplane commanders and 1232 co-pilots indicates that the men with high pilot aptitude scores (stanines) were likely to become commanders and men with low pilot aptitude scores were likely to become co-pilots.

HIGH STANINE PILOTS TEND TO BECOME AIRPLANE COMMANDERS



DATA INCLUDE 1218 B-24 AIRPLANE COMMANDERS AND 1232 CO-PILOTS WHO HAD ENTERED OPERATIONAL TRAINING IN THE 4TH AIR FORCE DURING THE LAST THREE QUARTERS OF 1944. EXPERIENCE CREDIT HAS NOT BEEN INCLUDED IN THE PILOT STANINE.

COMBAT

The ultimate goal in the selection program was to select pilots, navigators and bombardiers and other and other aircrew who would do the best job in combat. In order to evaluate this work, valid measures of combat proficiency were necessary. Obviously the combat situation does not lend itself to easy, valid measurement. The accuracy of bombing is a function of altitude, turbulence, visibility, winds, enemy action, the nature of the target, the equipment, the proficiency of the other personnel involved, as well as the person being evaluated. Similarly, the number of enemy planes brought down by fighter pilots is related to the number of opportunities a pilot has had, how well protected he was, how proficient and numerous the enemy was and so on. From these sparse examples, it can be seen that the evaluation of proficiency in combat conditions is necessarily subject to so many uncontrolled factors as to render its determination very tenuous.

In spite of these obvious difficulties, three Aircrew Research Detachments of psychologists went to combat areas in the European and Pacific theaters to collect data that would, among other things, determine whether the classification test scores predict success in the combat situation. Some of the measures of proficiency gathered were bombing errors, advancements achieved, victories, ratings of performance, accidents,

casualties, and transfer from duty because of unsatisfactory performance. These measures were compared with aptitude scores obtained from the Classification Tests to see whether "goodness" in combat was related to high aptitude scores. As might be expected, due to all the difficulties involved in proficiency measurement in combat, the relations between the test scores and combat measures were small.

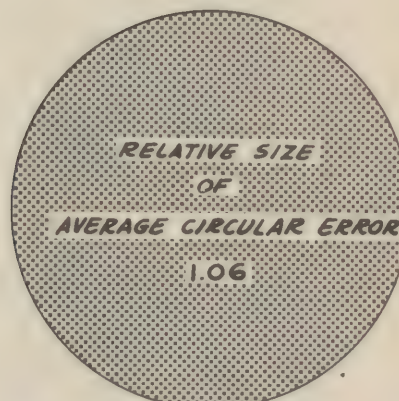
A few of the results obtained are presented in the following charts.

LEAD BOMBARDIERS WITH
HIGH BOMBARDIER STANINE TEND TO HAVE
LOWER AVERAGE CIRCULAR ERRORS

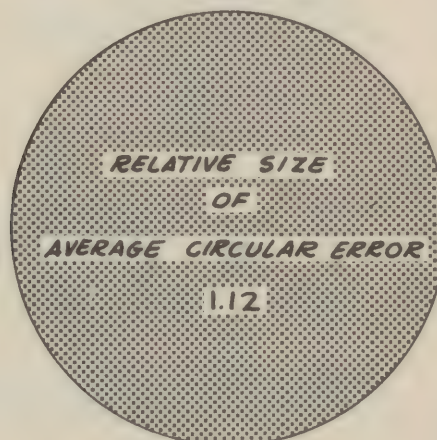
STANINE 7,8,9
TOP THIRD OF TOTAL GROUP



STANINE 6
MIDDLE THIRD OF TOTAL GROUP



STANINE 1,2,3,4,5
LOWEST THIRD OF TOTAL GROUP



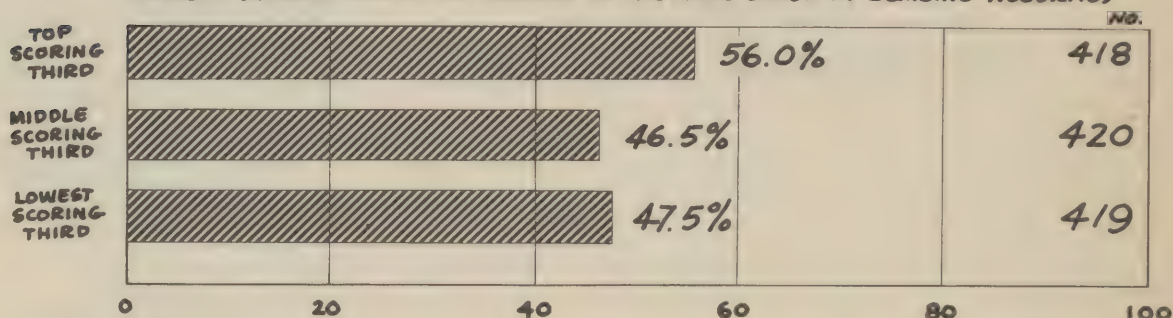
THESE FIGURES REPRESENT A COMPOSITE OF ALL OF THE DATA COLLECTED FROM THE 8TH AND 15TH AIR FORCES ON THE RELATION BETWEEN CIRCULAR BOMBING ERROR AND THE BOMBARDIER STANINE.

BOMBARDIERS WHO WERE SUPERIOR IN THESE ABILITIES **BEFORE THEY ENTERED TRAINING** **TENDED TO HAVE SMALLER CIRCULAR BOMBING ERRORS** **IN COMBAT**

THE ABILITY TO IDENTIFY TARGETS IN PHOTOGRAPHS

PERCENT SCORING ABOVE THE AVERAGE OF THE TOTAL GROUP IN BOMBING ACCURACY

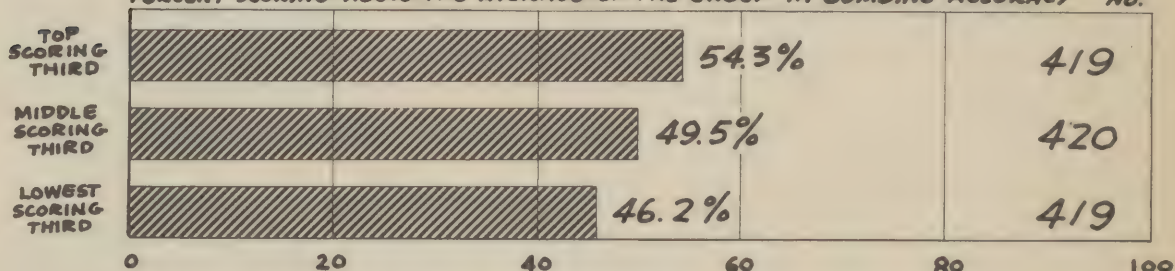
SCORES ON SPATIAL
ORIENTATION I TEST



THE ABILITY TO SELECT QUICKLY THE CORRECT MANUAL MOVEMENTS IN RESPONSE TO THE RELATIVE LOCATIONOF TWO COLORED LIGHTS

PERCENT SCORING ABOVE THE AVERAGE OF THE GROUP IN BOMBING ACCURACY

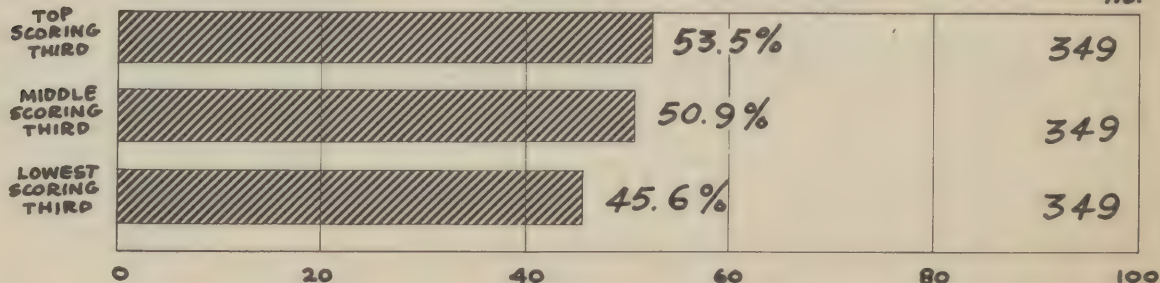
SCORES ON DISCRIMINATION
REACTION TIME TEST



KNOWLEDGE OF AND INTEREST IN AVIATION

PERCENT SCORING ABOVE THE AVERAGE OF THE TOTAL GROUP IN BOMBING ACCURACY

SCORES ON TECHNICAL
VOCABULARY-PILOT TEST



DATA COLLECTED BY AERD #1 AND AERD #2 FROM THE 8TH AND 15TH
AIR FORCES. THE BARS REPRESENT THE PERCENT SCORING BELOW
THE MEDIAN CIRCULAR ERROR AT EACH SCORING LEVEL.

RE-EVALUATED PILOTS

MEAN PILOT STANINE - 5.65
S.D. - 1.72
NO. - 377

AVERAGE
APPROXIMATELY $\frac{2}{3}$ OF THE
RE-EVALUATED PILOTS FELL
WITHIN THESE STANINE LIMITS

MEAN PILOT STANINE - 5.99
S.D. - 1.62
NO - 615

AVERAGE
APPROXIMATELY $\frac{2}{3}$ OF THE
CONTROL PILOTS FELL WITHIN
THESE STANINE LIMITS

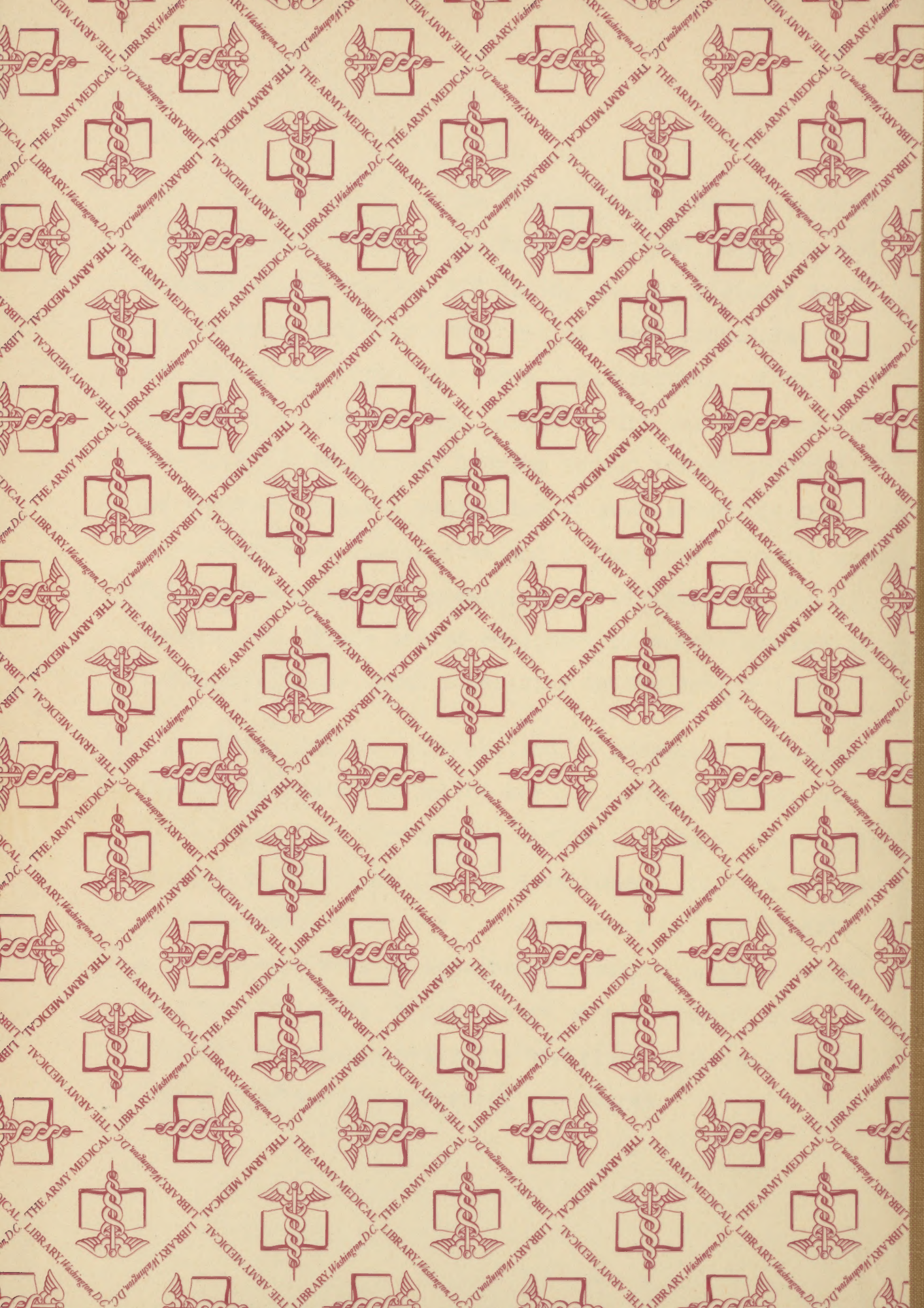
1 2 3 4 5 6 7 8 9

PILOT STANINE

DATA COLLECTED BY AERD#2 FROM THE 8TH, 12TH & 15TH AIR FORCES AND USSTAF. THE RE-EVALUATED PILOTS WERE GROUNDED AND/OR RECLASSIFIED BY CME, FEB, OR MDB FOR PSYCHDLOGICAL REASONS OR BECAUSE OF LACK OF PROFESSIONAL QUALIFICATIONS. THE CONTROL GROUP CONSISTED OF PILOTS WHO HAD FINISHED THEIR TOUR OF DUTY AND WERE MATCHED BY TESTING NUMBERS TO THE RE-EVALUATED PILOTS.

In conclusion, it is evident that these procedures were very effective in the work of aircrew selection and classification for the AAF during the war period. Many of the tests and other features of these procedures were adopted by the Royal Air Force, the French Air Forces, and other allied nations. Later in the war emphasis in the Aviation Psychology Program turned toward problems of the more accurate evaluation of men trained in the various aircrew specialties and to research on other problems of training and operations and of improving the effectiveness of the use of equipment by a more systematic consideration of human capacities in its design.

Plans for the continuation of psychological research during the peacetime period are now being developed and it is hoped that through the systematic use of scientific methods of investigation and development, it will be possible to achieve continuous improvement in operational effectiveness with an integrated research program beginning with problems in the design of new weapons and carrying on through selection and classification, training, evaluation and operating procedures.



Gaylord

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